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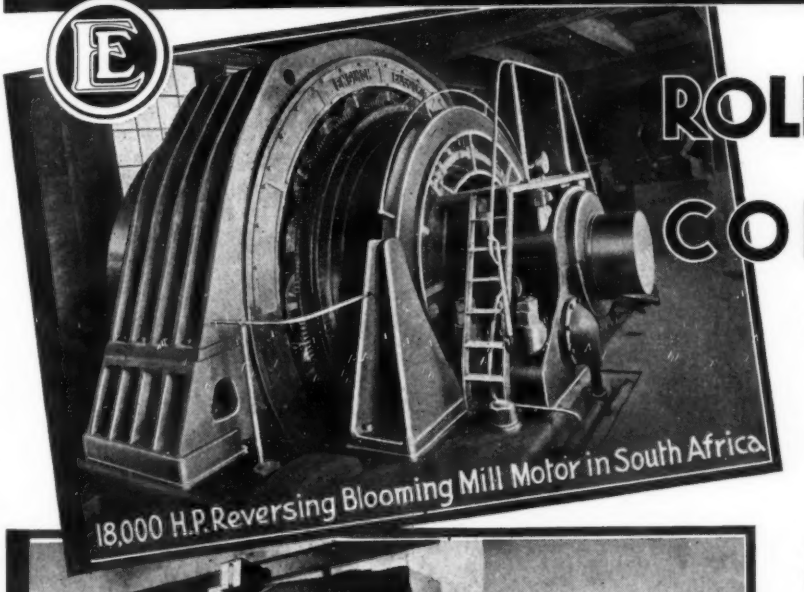

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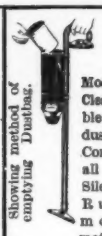

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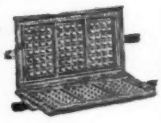

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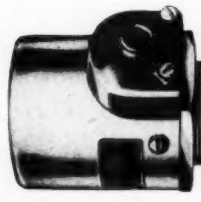

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The
Electrical Review

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Operation and Maintenance

ONE of the chief tasks of the electrical engineer nowadays is to devise technical methods of meeting the rapid growth in the public demand for electricity. He is under an obligation to see that scientific developments are not neutralised by lessened reliability or by greater risk to the operator or user, or by increased cost. He has the further duty of making the most of every advance in practice to remove those obstacles to the further use of electricity that have always been with us, irrespective of the number of kWh generated.

Prominent among the last-named is the failure of unsuitable flexible cables (especially at the point of entry into portable apparatus) which, as Mr. H. W. Swann, the Senior Electrical Inspector of Factories, points out in his report on electrical accidents during 1934, is responsible for more injuries than any other factor except switchgear of all kinds.

Next in importance are probably the breakage or absence of earthing conductors for portable apparatus and metal lampholders and the installation of switches in the neutral wire, while the use of unenclosed equipment in inflammable atmosphere or dusty atmospheres still causes explosions.

Even in public supply systems mistakes in earthing seemingly dead conductors are too much with us, and Mr. Swann suggests for high-voltage circuits a greater use of switchgear in which the temporary earthing connection is made through a circuit-breaker. He also raises the question as to whether an unlocked door or easily removable barrier can be regarded as a real protection where work is being carried out on adjacent gear.

Explosions too frequently occur with oil circuit-breakers when they are stressed beyond their capacities (even if the rating be correct in the light of modern knowledge), and responsible officials are often very much in the dark regarding the maximum kVA that can be liberated at any point under fault conditions. The same considerations apply to fuses, which are often called upon to clear currents far in excess of that for which they were intended.

Extensions into rural areas have directed attention to the design of outdoor switchgear, particularly of the open type. Appreciable improvement has been noticeable during the past few years, but it is doubtful whether some of the cheaper gear produced complies with the Home Office Regulations. Possibly changes in design staffs are responsible for the re-appearance of old errors, but more effort might be made in the initial stages to ascertain the views of the Department if any uncertainty exists.

Generally speaking, methods of operation and maintenance, rather than design or construction, seem to be responsible for most accidents, and a large proportion of the dangerous occurrences dealt with in the report indicate ineffective supervision under working conditions.

The deduction to be drawn is that high technical qualifications, always accompanied by the attributes of care, foresight, and common sense, are more important now than ever they were.

The Grading Question

ONCE upon a time the organisation of an electricity works staff was a quite simple matter and the differences between one undertaking and another were not particularly marked. To-day it has become a very complex affair and the variations between system and system give rise to discussion concerning the merits of a nearer approach to uniformity. The growth of systems, the introduction of new and specialised technical and commercial duties, and the decisions of chiefs and their employers, have brought into existence officials who are not graded according to the recognised schedules. The views of many power station officials in favour of revised classification and grading which shall provide for such cases are expressed in an article by Mr. D. Shipton Wood, appearing on a later page of this issue. The

author urges the National Joint Board to go very thoroughly into the whole question of designations, duties and grading with a view to removing causes for discontent amongst members of the E.P.E.A. who are uncertain where they stand. We shall be pleased to have further views from readers of the ELECTRICAL REVIEW on this important question.

Cheap Lighting

MOUNTAIN Ash (Glamorgan) must surely hold the record for cheap electricity for lighting. For some time the flat rate has been 3d. per kWh with a discount of ¼d. per kWh for prompt payment. As from September the discount is to be increased to 1¼d. resulting in a net charge of 1¼d. per kWh. One reason for this low charge is the fact that the debt on the undertaking was paid off two or three years ago. We believe that Hampstead is the only other municipal undertaking in this happy position. It is also the practice at Mountain Ash to give consumers a "Christmas box" in the form of a further discount on their December accounts—a practice which Mr. E. W. Jones, the general manager, hopes to be able to continue this year.

Supply and Demand

ALTHOUGH in its general terms the report of the F.B.I. Committee on Reorganisation in Industry, reviewed in this issue, deals with the older basic industries of this country it provides food for thought for electrical men, especially those concerned with export trade. Stimulated by the post-war boom these older industries expanded their productive capacity to an extent which rendered the effects of the subsequent slump disastrous. The problem before industry is to relate production with consumption. In a public utility service such as electricity supply where the demand is a steadily rising one the way is fairly clear, although even in this instance Government intervention was necessary to bring about co-ordination. But in an industry affected by external influences beyond the control of the national Government the case is different and can ultimately be solved only by international agreement. First, however, internal agreement is essential; an industry which speaks with several voices cannot expect to meet with much success in international negotiations.

Glasses for Welders

THE eyes of welding operatives are exposed to high intensity radiations. These are: infra-red, which cause heating and may lead to cataract; light, by which objects are visible; and ultra-violet, the effects of which may be painful and even serious. Protective glasses that appear superficially to be of the same colour and density and so to possess the same properties as regards visible light, may have quite different characteristics as regards infra-red and ultra-violet rays, but safe glass of an approximately neutral colour is available. A draft British Standard Specification proposes the grading of glasses, irrespective of colour, according to the proportions of light absorbed by them and sets limits to the maximum transmission of both infra-red and ultra-violet radiations. In view of the rapidly increasing scope of electric welding a specification of this kind is urgently needed.

A Meter Problem

A PECULIAR situation has arisen as the result of a judgment of the Court of Appeal this week. A consumer at East Ham disputed the accuracy of the electricity meter installed by the Corporation and, refusing to pay what the Corporation demanded, was deprived of his supply. He successfully brought an action against the Corporation, which appealed against the judgment obtained. The meter, it was said, had been tested and found to be accurate but because it had not been approved by an "electric inspector" as required by Clause 50 of the Schedule to the Electric Lighting Clauses Act, 1899, as amended by the Act of 1909, it was held that payment could not be enforced. Apparently approval by the Electricity Commissioners (who now exercise the powers formerly vested in the Board of Trade) is not sufficient by itself. As Lord Justice Slesser remarked, only one or two "electric inspectors" have been appointed by undertakings in this country and it would appear that all but a few hundred meters in use are not properly certified. If such is really the case a serious loophole in the Act needs to be closed up at the earliest possible date or disputed meter readings will become the rule rather than the exception as at present.

Resuscitation

THE effect of the time element on the severity of an electric shock is touched upon in the report of the Senior Electrical Inspector of Factories, which is reviewed in a later page of this issue. There is seemingly not much difference in the electrical conditions that produce a fatal result or a more or less slight shock. If a man grips a live conductor it may not be possible to release his hand before he becomes unconscious, in which case resuscitation may be difficult, even if artificial respiration be applied immediately and for a prolonged period. On the other hand, the mere touching of a conductor under similar conditions may incapacitate the injured man for only a few days.

Ignorance and the Remedy

THAT there is still need of education as to the value of artificial respiration methods is shown by one case in which the victim was embedded in sand by his fellow-workmen in the hope that the electricity would thereby be "drawn out of his body"! Such folly is quite incomprehensible—whether those guilty of it were electrical men or not. Action should be taken by all owners of installations to see that their employés working in the vicinity of electrical machinery and apparatus are informed regarding the course to be pursued in shock emergency. For more than forty years the ELECTRICAL REVIEW Shock Sheets or Cards giving full and illustrated instructions concerning the application of artificial respiration have been available. They are hanging in some material or other on factory and workshop walls, in stations, in mines, etc., in all parts of this country and overseas, but their use needs to be far more general in view of the rapid growth of electrical applications in recent years.

It Can be Done!

IN their half-yearly report the directors of the Gas Light and Coke Co. state that a remarkable feature of the company's business in recent weeks has been the great and growing public demand for gas refrigerators. The number of these is said to have increased more than ten-fold since May. This is a good indication of the amount of business which is available in this direction. If the gas people can sell refrigerators (and they are doing it by means of low hire-purchase terms) the electrical industry should find it a simple matter, for it can offer the same size of refrigerator at the same price, minus fumes and fuss.

A Gas Myth Exploded

SOME of the daily newspapers reported last week that Hull's all-electric housing estate was to be equipped with gas because the tenants had asked for it. Mr. J. N. Waite, the general manager and engineer of the Hull Electricity Department, has written to these papers pointing out that their information is not strictly accurate. The estate is not all-electric—in fact it isn't in existence yet—and so the tenants are the dream-children of somebody rather careless about facts. The true story is that the local gas company has (quite rightly) been given permission to provide a gas service to any future tenant who requires it. The houses will be equipped with electric light, electric wash-boilers and coal ovens.

Low-fall Turbines.

Recent developments in hydro-electric practice

By F. Johnstone Taylor

WITH low falls the variation of head is considerably greater than with medium or high falls, and the orthodox type of Francis turbine does not maintain its efficiency when operated on either higher or lower heads than that for which it is designed.

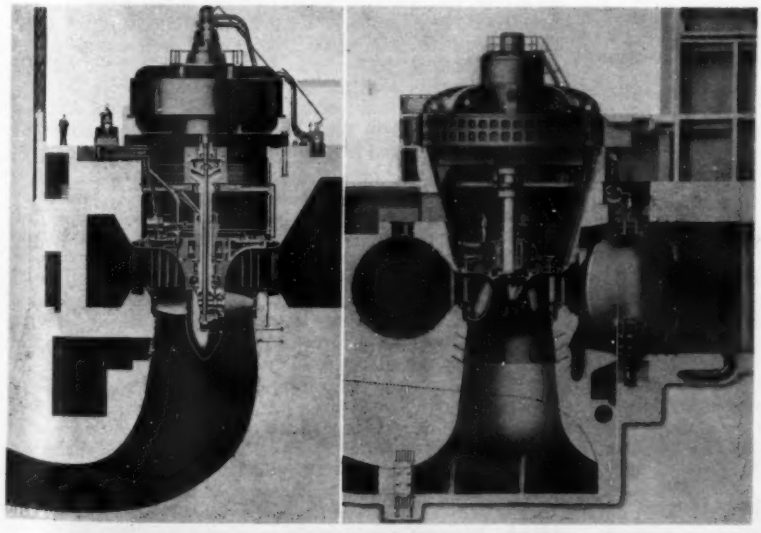
Certain of these conditions are comparatively well met by fixed-bladed propeller-type turbines of the Lacazewek class which differ from the Francis type chiefly in the form of their runners, which have nearly straight downwardly inclined blades. They are usually operated under water conditions which best suit them; whereas for continuous work the Kaplan type, with its movable blades, though more costly to install, has proved satisfactory.

For medium-sized units the open-flume setting is cheaper. The exterior gate-operating mechanism is so placed above the crown plate as to be readily accessible. The mechanism, consisting of steel levers keyed to the upper ends of the gate stem, is connected to the gate shift ring by means of breaking links and eccentric bolts. The former provide a measure of safety against any obstruction which might lodge between the gates, while the latter permit of accurate and independent adjustment of each gate with wear so that the minimum leakage of water and simultaneous closure can always be assured. In this design the speed ring is a one-piece casting, the stationary guide vanes being integral with the upper and lower flanges. It is embedded in the concrete of the power-house foundations and the crown plate and wicket gates are supported in and aligned by it.

The Morgan-Smith Kaplan sets installed at Safe Harbour, Pa., develop 42,500 h.p. at 109 r.p.m. on 55-ft. head. The ultimate capacity of this station, which has a 5,000-ft. dam, will be 500,000 kW. The 18-ft. runners, which have five blades, are below tail-water level, now common practice in order to reduce risk of cavitation.

On the pilot exciter are three slip rings to supply 163 V 7.27-cycle power to the actuator motor and the torque motor on the safety latch. Until the torque motor is energised the pilot valve cannot rise beyond the no-load speed position except when raised manually, therefore the unit cannot be placed in service under governor control without the flyballs turning. As a further preventive of the risk of cavitation the operator is provided with load limits to work to for different head conditions. Four of the installed units are three-phase, 60-cycle, 13,800-V, 28,000-kW sets with a maximum rating of 36,000 kVA at 0.8 p.f. The other is a single phase 25-cycle machine rated at 28,000 kW at 0.8 p.f.

A turbine with adjustable blades by the I. P. Morris Co.

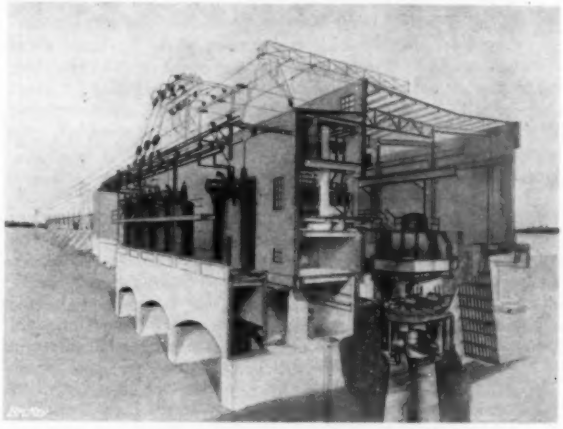


Cross-section of a 42,500-h.p. Kaplan turbine built for the Safe Harbour Water Power Corporation, and (right) of a set for the Conowingo scheme

is relatively cheap to install as there are no movable guides, the runner blades being adjusted, according to load, by an oil-pressure cylinder built as part of the turbine shaft through which the oil connections extend. The stay ring, gate mechanism and head cover are replaced by a radial vane-bearing support. The vanes are formed to give the most efficient water entrance to the runner in any particular instance and support the guide bearing, which is of the rubber water-lubricated class.

The operating mechanism in the runner hub holds the blades while the turbine is running, the servo motor in the shaft being moved by oil pressure controlled by the usual form of governor. The shut position of the turbine being with the blades at their flattest angle, such water as does pass can be shut off at the head gate. It is not sufficient to cause motion of the runner. With its high speed and low cost and high part-load efficiency (about 89 per cent. from 70 to 90 per cent. load) this machine is claimed to be very well suited to small plants operating at under 60-ft. head and under variable flows, and is well adapted to automatic operation.

Larger units are those at the Conowingo development.



Adjustable runner unit at the Back River station of the Montreal Island Power Co.

While their capacities (54,000 h.p. at 81.8 r.p.m. on 89-ft. head) have frequently been exceeded and are less than half that of the 115,000-h.p. sets being built for the Boulder Dam scheme by Allis-Chalmers, they are, in actual dimensions, the largest units yet constructed. Three were installed by the Morris Co. and four by Allis-Chalmers; they incorporate a 27-ft diameter butterfly valve, and tight closure is provided by means of a rubber tubular seating ring which is expanded by hydraulic pressure against the periphery of the valve disc when in its closed position. The cast-steel runners have an outside diameter of 17 ft. and are built in three sections held within a continuous outer band. Other special features are the Moody spreading draft tube, steel-plate volute casing measuring 62 ft. on the longitudinal centre line of the power house, draft-tube stay vanes and lignum vitae water-lubricated bearings.

Another recent development is the adjustable-blade propeller turbine (as opposed to the movable blade system of the Kaplan) in which the angle of the blades can be altered by the power-house attendants to suit varying conditions of water level and power demand. This comparatively cheap arrangement is embodied in three Allis-Chalmers 12,000-h.p. 85.7-r.p.m. units installed at the Montreal Island Power Co.'s Back River plant on 26-ft. head, and combines the advantages of the costly Kaplan with those of the efficient and relatively inexpensive propeller or axial-flow runner. Three similar units by the Morris Co. develop 8,800 h.p. under the same water conditions. These manually adjustable runner blades are controlled by adjusting screws at the main shaft coupling: they actuate the blades through a rotary adjusting shaft within the hollow main shaft of the turbine and through special mechanism within the shaft coupling and runner hub.

While propeller-type turbines of any kind are essentially suited to low-fall work, especially where the level of the head and tail water varies seasonably, those installed by Messrs. Escher Wyss at Wettingen on the Limmat River in the vicinity of Zurich develop 10,710 h.p. under a head of 76 ft. at the exceptionally high speed of 214 r.p.m. with a discharge of 40.m³ sec.

Each machine has a cone-shaped dome connected with the lower end of the runner wheel hub to provide for the passage of water over the middle wall of the suction tube, and in view of the high discharge speed the upper portion of the suction tube and the dome are steel armoured. It is claimed that this design reduces hydraulic friction to a minimum and, moreover, the rigid dome can be used for removing the turbine wheel.

Each of these units is built into a cast-steel centre ring and is provided with rigid external guide vanes, the ring being welded to a sheet-metal spiral casing. The spirals are entirely made from welded material and the stainless-steel runner blades are located below tail-water level.

This is one of three hydro-electric stations on the Limmat River which have recently been modernised by the installation of Kaplan turbines to replace old Jonvals. Most of them are quite small; two at Dietikon are rated at 1,025 to 1,700 h.p. at 93.8 r.p.m. under an average head of 9½ ft. with a discharge of 36 m³ sec., while a 800-h.p. 94-r.p.m. set at Turgi on an average head of 9 ft. and a discharge of 25.5 m³ sec. has a speed increasing gear for driving its Oerlikon d.c. generator at 600 to 700 r.p.m.

Electric Postal Vehicles

Experience of the German authorities proves their advantages

THE German Reichspost, which first experimented with petrol vehicle during the closing years of the last century, now uses electric vehicles for most of its local and short distance traffic. Immediate starting and rapid acceleration make the electric vehicle superior to petrol vehicles in speed and capacity in town service and, according to Ministerialrat Dipl.-Ing. F. Hubrig in *Elektrotechnische Zeitschrift*, the annual consumption of electric vehicles in Germany is at present 120 million kWh per annum.

The operating and economic advantages of the electric vehicle are particularly evident in parcels delivery service; but its present uses extend also to other forms of town and suburban postal service involving journeys not exceeding 37-43½ miles, and gradients normally not exceeding 1 in 20 to 30, though short inclines of 1 in 10 to 14 can be negotiated quite satisfactorily by electric vehicles. Horses have been eliminated from the Berlin parcel post since 1925, and the Berlin division of the Reichspost has now about 1,119 motor vehicles of which 724, or nearly 65 per cent., are electric vehicles, including 2-ton and ¾-ton vehicles, trucks and tractors. Large numbers of electric vehicles are also used in the Hamburg, Cologne, Düsseldorf, Frankfort-on-Main, Stuttgart, Munich, Nuremberg, Leipzig, Dresden, Breslau and Königsberg postal areas, the total number being about 2,400.

Faster Than Petrol Vehicles

In order to dispose of the mistaken impression that electric vehicles are slower than petrol vehicles in delivery service, tests were made by the A.E.G. with 2-ton electric and petrol vehicles delivering 55-lb. consignments at intervals ranging from 33 to 330 yd., and finally running 13.7 miles in Berlin with no intentional stop, but subject to traffic control and the obstruction of other road users. The results, summarised in Table I, show that even in the 13.7-mile run the electric vehicle was 2.5 per cent. faster than the petrol vehicle, while in house-to-house delivery (33 yd. between stops) it was 90 per cent. faster than its rival.

TABLE I.
AVERAGE SPEEDS OF ELECTRIC AND PETROL VEHICLES.

Distance between stops	Average speed, m.p.h. (approx.)		Electric vehicle faster by, per cent.	Watt-hr. per ton-mile, approx.
	Electric vehicle	Petrol vehicle		
33 yd.	8.1	4.2	90	572
110 yd.	10.3	7.8	32	327
220 yd.	12.7	10.9	16	245
330 yd.	14.3	13.1	9.5	212
13.7-mile run ... ... (traffic stops only)	12.75	12.45	2.5	—

Electric vehicles are also definitely superior to petrol vehicles in economy of operation due to: (1) their long life, at least 15 years at about 40 miles a day; (2) the low maintenance cost resulting from the simplicity of construction, and the absence of clutch, gear box, cooling system, etc.; (3) the high efficiency of energy conversion and transmission, and the absence of idle running; and (4) the low wear on tyres and low consumption of lubricating oil. The disadvantage of relatively high deadweight can be reduced in some services by adopting a smaller radius of action and a lower maximum speed, thus permitting the use of a lighter battery.

Single-motor drive is used in the Reichspost's parcel-delivery vans, and during recent years all the motors have been of the double-commutator type, giving a wide range of control by series-parallel switching of armature windings and field coils without subdividing the battery, and with series resistance only at starting. The smooth and rapid acceleration of a ¾-ton delivery van is shown by the data in table 2; and it is claimed to result in 30 per cent. reduction in wear on tyres compared with petrol vehicles in frequent stopping service. Cardan drive is used instead of chains in the latest vehicles on account of its silence and economical upkeep.

The German postal authorities attach considerable importance to the reduced accident risk resulting from the low maximum speed of electric vehicles, and to the advantages of these vehicles in silent running and complete avoidance of atmospheric pollution—both important considerations in city service. From the economic standpoint, even greater importance is attached to the saving in operating costs and to the use of electrical energy instead of imported petrol. In the services for which they are used at present, the electric vehicles of the Berlin postal department are estimated to save about £55,000 per annum (at 20 mk.=£1) compared with petrol vehicles. This is based on electricity at 0.794d. per kWh (the standard price to the Post Office in Berlin), the cost of current then being 0.386d. per mile for the ¾-ton, and 0.744d. per mile for the 2-ton vans. Maintenance of chassis and body, including painting, averages 1.08d. and 1.31d. per mile for the two sizes. The total cost excluding wages but including capital charges, is 5.2d. per mile for the ¾-ton van and 7.35d. per mile for the 2-ton vehicle.

TABLE II.
CURRENT AND SPEED VALUES FOR ¾-TON ELECTRIC PARCEL-DELIVERY VAN.

Time from start. Secs.	Controller notch. No.	Max./Min. current. Amps.	Maximum speed. m.p.h.
0	1	45/16	5.2
3½	2	35/18	6.8
5½	3	32/24	8.7
7	4	60/37	12.4
9½	5	75/48	15.5 (12 secs. from start)

Life of Batteries

Pasted-plate 40-cell batteries are used, of 150 Ah, 30 A discharge current, 1,060 lb. weight for the ¾-ton van, and 280 Ah, 56 A, 1,880 lb. for the 2-ton vehicle. The life of the plates varies with the service and is from 8,700 to 11,800 miles for the positives and 16,200 to 31,000 miles for the negatives of the battery of a ¾-ton van; and 8,100-10,000 miles for the positives and 15,000-29,300 miles for the negatives in a 2-ton vehicle. The batteries are removed from the vehicles for charging and a 50 per cent. equipment of spare batteries is maintained so that vehicles need never be kept waiting. Rectifiers are used in small and medium sized charging stations, and rotary convertors are employed when the demand justifies them.

The author considers that probably one-half and certainly one-third of German commercial road vehicles might advantageously be driven electrically. It would be a mistake to attempt to revive the use of battery vehicles for passenger transport, excepting perhaps certain city bus services, but for house-to-house delivery purposes and for the carriage of goods between railway stations, factories, warehouses and so on, electric vehicles are by far the most economical means of transport for distances up to about 40 miles a day. Most of the vehicles used in municipal services should also be driven electrically.

As the use of electric vehicles extends, there may be scope for a network of public charging stations, with facilities for boosting charges and battery exchange, provided that a strictly limited number of types of batteries be used. The immediate requirement, however, concerns the normal re-charging of batteries. It is in the interests of supply stations that the charging should be done at night and recent developments in automatic charging equipment using rectifiers, enable charging to be done conveniently on owners' premises, eliminating waste mileage and the administrative complications and costs of central charging stations. Finally, battery and rectifier performances are known with such accuracy that there is no difficulty in arriving at overall battery charging and maintenance prices acceptable to both parties and providing the simplest possible basis for accounts.

Grid Connection Problems. By R. Wright

Capacity effects and voltage regulation at a generating station

THE following article relates to experiences when operating a power station connected to the grid. The conditions are that power transmitted from a remote point A (fig. 1) is stepped down from 132 kV to 33 kV at the grid sub-station and stepped up again to 132 kV, or vice versa. There is always some transfer of power up to a maximum of 11,500 kW, but although the indicating wattmeters may swing by 2,000 kW there is no interference with the 33 kV, 11 kV, or 3.3 kV loadings, and the output and frequency of the 3.3 kV generators remain steady.

A leading wattless effect was experienced when testing a 47-mile length of 132-kV overhead line under the conditions shown in fig. 1. The reserve bus-bars at the various voltages were used for the test. All switches were closed prior to switching in a 2,500-kW 3.3-kV (m.c.r.) turbo-alternator. When the machine breaker was closed, although the field switch was left open so that the only excitation was due to residual magnetism, the voltage built up within a few seconds to 3,200 V and remained there, the capacity charging kVA being 3,600.

With a 7,500-kW set under the same conditions the voltage rose to 3,200 V with the field switch closed and all exciter field resistance in. No exciter voltage or current was indicated by the instruments as flowing in the alternator rotor circuit.

A 33-kV overhead ring main (fig. 2) having a total length of 80.2 miles was fed from 33-kV bus-bars through one switch, the second switch being open. The load on the feeder was 1,200 kW and the voltage across the open switch was 37 kV, showing a rise of 2 kV due to capacity. This rise increases with a decrease in load at the sub-station.

A similar effect obtains with 132-kV lines, if long enough to have reasonable capacitance, so that a line connected to one station and open-ended at the other station may have a higher voltage at the open end; 128 kV at the closed end with 134 kV at the open end have been recorded. It would therefore appear logical that to reduce the 134 kV to 132 kV when switching in the voltage at the connected end should be reduced. This is not so, however; the voltage at the 128-kV end must be raised, that is, more taps must be added to the transformer at the connected end. This effect is caused by the increased inductive reactance in circuit due to the addition of more turns to the transmitting transformer, which results in a reduction of voltage at the open end of the line. By reducing the 128-kV voltage the transformer offers less reactive inductance, due to fewer turns of the winding being in circuit, thus allowing the equivalent capacity effect to be increased, which in turn increases the open-end voltage.

Insulating Discs

The increased capacitance obtained by adding extra insulating discs to an overhead line was demonstrated when two extra discs per insulator were fitted to a 48-mile 132-kV line, the capacitance being increased from 3,600 to 3,950 kVAr. Increasing the voltage also increases the capacity kVAr. On

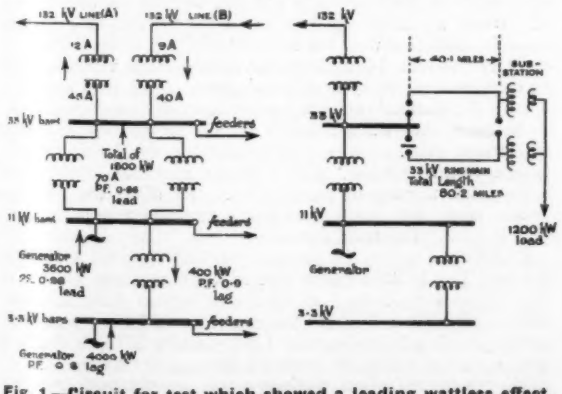


Fig. 1.—Circuit for test which showed a leading wattless effect. Fig. 2.—A 33-kV ring main on which there was a rise of 2 kV due to capacity

a 33/132-kV 10,000-kVA transformer with the 33 kV side supplied at 32.8 kV, the capacity kVAr of the above line was 3,900; when the voltage was raised to 34 kV. the kVAr was increased to 4,200, the line being opened at the far end.

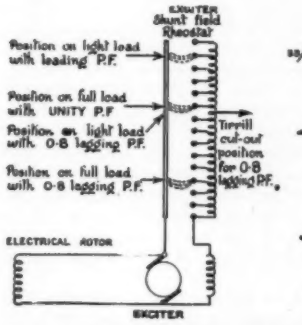
The station which I supervise is peculiarly situated in regard to the length of overhead lines that can be switched on to the bus-bars. Neglecting overhead transmission lines at voltages below 33 kV (of which there are several miles) the maximum which can be, and has been, switched on to the station is as follows :—

	Miles.	kVA leading.	
132 kV north line :			
1st section	30.3	2,000	(1)
1st and 2nd sections connected ...	57.5	4,500	(2)
1st, 2nd and 3rd sections connected ...	118.9	8,500	(3)
33 kV north line	8	*57	(4)
33 kV west line	80.2	570 (est.)	(5)
132 kV south line :			
1st section	48	2,500	(6)
1st and 2nd sections connected ...	66.75	4,500	(7)
1st, 2nd and 3rd sections connected ...	90	6,000 (est.)	(8)
33 kV south line	30	Not known.	(9)

* This line takes an energising current estimated at 1 A at 33 kV when open-ended at the feeding point.

Normally 1, 4, 5, 7 and 9 are connected to the station, giving a leading kVAr of 7,127. The maximum number connected has been 3+4+5+7+9, giving 13,627 leading kVAr.

The set generally running is rated at 15,000 kW, and for a time the approximate loading conditions were from 10,000 kW


EXCITER Shunt field Rheostat
Position on light load with leading P.F.
Position on full load with UNITY P.F.
Position on light load with 0·8 lagging P.F.
Position on full load with 0·8 lagging P.F.
Tirrill cut-out position for 0·8 lagging P.F.
ELECTRICAL ROTOR
EXCITER

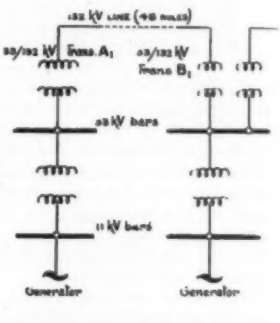


Fig. 3.—Diagram showing cut-out positions. Fig. 4.—Connected stations which are both given the benefit of reactive kVA by tap-changing on two transformers

on maximum load periods to 3,000 kW on the lighter loads. With a load of 3,000 kW the leading reactive kVAr with 2+4+5+7 connected totalled 9,627, resulting in a leading power factor of 0.3 on the turbine. With 10,000-kW loading a 0.94 leading power factor was obtained.

When the machine loading was reduced below 5,000 kW the excitation became extremely unstable, as at this point the exciter shunt-field rheostat was practically " all in " and variations of 50 to 100 kW in the power load caused appreciable voltage fluctuations. Switching on load compensated for part of the leading capacity reaction and the voltage of the machine fell; switching off an equivalent load caused the increased capacity reaction to act as an exciting medium and increased the machine voltage.

The voltage charts show that, on full load, voltage regulation is fairly good, but that, as the load decreases the exciting effect of the capacity current becomes very pronounced and variations of load produce marked fluctations.

Energising Effect of Capacity

When the line was switched in, a rise in pressure of 390 V occurred on the 3.3-kV bus-bars, the " kick " being slightly reduced by hand operation of the exciter rheostat. When the line was switched out a minute or two afterwards there was a drop in voltage of 420 V. This indicates quite clearly the energising effect of capacity when switched on and off a generator; the variations would have been greater if the exciter shunt regulating resistance had not been adjusted by hand.

A Tirrill regulator originally installed to deal with a power factor of 0.8 lagging cannot be used under present conditions. When dealing with full load the power factor is about unity, or slightly leading, and if the cut-out position on the Tirrill regulating resistance were adjusted to meet this condition it would have to be altered again for increments of reduced load, because on the lighter loads almost all the regulating resistance of the exciter shunt field is cut in. Such a state of affairs (which depends upon the human element) would sooner or later lead to trouble, as, if the cut-out position had not been altered to a lower setting on light load, and the instrument tripped, the machine voltage would immediately have risen owing to too much shunt regulating resistance having been cut out of the exciter field (fig. 3). In the laying down of a new station the alternator designers would, no doubt, give full consideration to the capacity kVAr to be carried if the generators are to be connected to long lengths of overhead lines.

On the lighter loads voltage regulation became rather acute and a generator was metered with inductive loading so as to assist in neutralising the capacity effect. With a 6,500-kW

load on a 15,000-kW machine the power factor was reduced from 0.99 to 0.93 lag with a 3,300-V machine taking a motoring amperage of 330. At 2,800-kW load the power factor was altered from 0.69 to 0.96 lead, with the same machine motoring at 275 A.

The exciter of the 15,000-kW set has a capacity of 300 A at 250 V. The highest capacity kVAr shown is 4,300, which is considerably less than the maximum recorded.

The following table shows the exciter to be running on the sloping part of its characteristic, especially when the machine is dealing with light loads, so that a slight variation in excitation ampères will make a considerable difference in the machine voltage.

Exciter.		Turbo-generator.		Inductive reactive kVA.	Capacity reactive kVA.
Amperes.	Volts.	kW load.	Power factor.		
158	75	10,200	.96 lag.	3,300	2,700
108	50	8,000	.98 lead.	1,700	4,200
99	45	7,000	.95 ,,	1,700	4,200
90	44	6,000	.94 ,,	1,600	3,200
80	40	5,400	.93 ,,	1,600	4,300
108	34	2,000	.98 lag.	700	500

A curious voltage creeping effect has often been observed, but until quite recently its cause was unknown. It happens at any loading with no similar set of conditions. The machine voltage will gradually rise by from 200 to 300 V on the 3.3-kV bus-bars (the other voltages varying in proportion) before the attendant has time to adjust the exciter rheostat to compensate for the new condition. After a period of from one to ten minutes the voltage will slowly fall again, the exciter rheostat having to be altered accordingly. At times the voltage first falls and then rises.

The cause has been traced to the shifting of reactive kVA and is definitely not due to transformer tap changing in the area, as this results in a sudden move of reactive kVA, whereas to cause the voltage creeping experienced the reactive kVA must, and does, move slowly from one value to another.

Probable Cause of Fluctuation

Recently with a machine loading of 9,000 kW at unity power factor the capacity kVAr altered very slowly from 4,000 to 3,000, causing a drop of 320 V on the 3.3-kV system. During the period that the kVAr was falling no adjustment was made on the exciter rheostat so that the maximum voltage variation could be noted. This fluctuation of capacity reactive could be accounted for by an increase in voltage on the station bus-bars south of the station under consideration, but as this appears to have remained normal I would suggest that this effect might have been produced by a large cloud or bank of fog enveloping part of the 132-kV line and thus reducing its capacity.

At one period when the load was only 2,000 kW (which included 340 A taken to motor a 3,750-kW generator) at 0.93 power factor, fifty miles of 132-kV line carrying 950 kW at 0.28 leading power factor had to be switched out. A 2,500-kW turbo-alternator was also motored to reduce the power factor to 0.85 lag, the undertaking power factor being 0.8 lag. The switches of the two motoring alternators and the 132-kV line switch were then opened by three men at the same time; this resulted in only a slight "kick" in the supply voltage due to the small difference of the two power factors.

The m.c.r. amperage of the 3,750 kW turbo-alternator is 786 and the maximum current obtainable when running as a motor was 340 A. The 2,500-kW machine is rated at 524 A, and its maximum motoring current was 225.

In order to cut down the excitation to obtain the desired motoring amperes for power factor correction the exciter shunt-field rheostat was cut "all in," giving the minimum of excitation to the rotor.

When taking the machine off the bars after motoring the excitation is gradually increased until the motoring amperes are reduced to a minimum. As the current of the motoring alternator is increased the generating machine voltage is reduced owing to the added inductive kVAr, and this must be rectified as the motoring current is increased. The reverse operation is called for when the motor is being taken off the bars.

Reactive kVA Shifting

If a station is troubled with too much capacity reactive kVA the alternators will have weak fields to allow for the exciting effect of the leading wattless. If the excitation is increased other means must be taken to lower the voltage to the normal value.

When an independent station is connected to an over-head system the rotor exciter current can be increased by motoring another set or adding inductive reactive kVA, but when connected to a system like the grid compensation can be obtained for a slight rise of the machine voltage by changing the taps on the transformer so as to reduce the outgoing voltage; this will allow reactive kVA to be moved one way or another.

Assuming a station A in fig. 4 to be running with a leading power factor and a station B with a lagging power factor the former is importing capacity kVAr and running with under-excited machines, while the latter is exporting inductive kVAr and running with over-excited machines.

The benefit of the capacity reactive kVA can be given to both stations by tap-changing on the two transformers A and B. The excitation of the generator in station A must be increased, so the taps are gradually lowered on transformer A; this would automatically reduce the voltage of the generator, due to the capacity kVAr being moved off the bus-bars, if it were not steadied by increasing the excitation. To maintain a regular voltage on the 132-kV line connecting the two stations (to which other sub-stations are connected), for each tap down on transformer A an equivalent tap up must be made on transformer B, which will necessitate the excitation of the generator in station B being reduced accordingly. This process of "tapping" down and up is continued until the surplus capacity kVAr is transferred to station B. Up to 8,000 reactive kVA has been transferred by this method on one line alone, the reactive component being altered from 3,800 kVA capacity to 4,000 kVA inductive.

With 10,000-kVA transformers having fifteen tap positions on the h.v. side, each tap giving voltage increments of 1.43 per cent., the changing of one tap moves approximately 334 re-

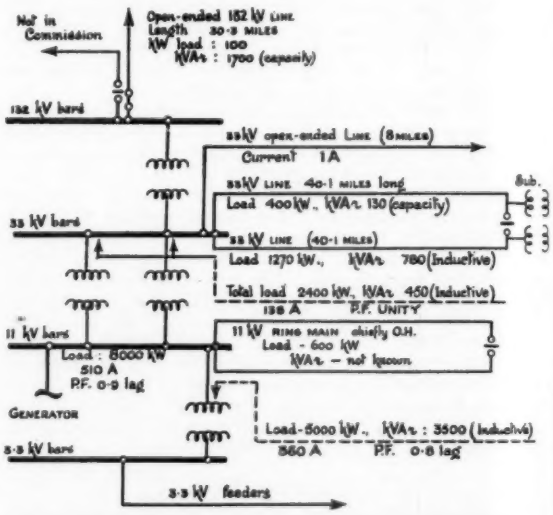


Fig. 5.—Effect of overhead lines on the generator power factor

active kVA. If 3,300 capacity kVAr has to be moved from station A ten taps have to be altered which would mean five taps *down* on transformer A and five taps *up* on transformer B. When tap changing is done on 132-kV lines the various stations connected with the line (especially if of small installed capacity) should be notified so that voltage variations can be compensated for by hand regulation. When lines are to be opened the stations concerned must know the amount of kVAr to be dealt with when the line is clear so that the necessary adjustment can be made prior to opening the circuit-breaker, thus obviating voltage "kicks" on the system.

How the moving of reactive kVA can affect the machine power factor and consequently the machine voltage is illustrated by the following figures:—

(1) With a load on the generator of 7,000 kW, 505 A and p.f. 0.8 lag, No. 1 132-kV line carried 2,600 capacity kVAr and No. 2 line with a load of 1,500 kW carried 3,700 inductive kVAr (2) With a load on the generator of 7,000 kW, 275 A. unity p.f., No. 1 line carried 1,000 capacity kVAr and No. 2 with a load of 1,000 kW carried 2,800 capacity kVAr.

All the figures given in these notes are obtained from the switchboard instruments, which are sufficiently accurate for the present purpose.

Development in South-West Durham

The South-West Durham Reconstruction and Development Board has issued a folder outlining the facilities available in the area for manufacturers contemplating the starting-up of new factories. This indicates some of the varied industries already established, transport, electricity supply, water supply, and other services, while the Board is prepared to supply details of numerous industrial sites.

Automatic Cooking Temperature Control

Some unorthodox ideas and their application

WHAT is the best form of cooking? Is automatic control of electric cooking a desirable development? We will admit only one answer to the first of these questions—electric. Whatever the present ideas are on the second question it is obvious that now is the time to set about finding out whether automatic control should be generally adopted.

The issue seems to have arrived somewhat suddenly, probably owing to the fillip given to gas cooking by recent intense publicity, and manufacturers are concerned about the question of cooker design while supply engineers are worried about the possible extra cost.

We regard the broad question of electric cooking at the moment of vital importance to the whole industry, because it governs the outlook of the load builder. And because the prominent question of automatic control is likely to have a far-reaching effect on electrical development, either good or bad, according to whether the decision made will ultimately be right or wrong, we attach the greatest possible importance to the subject at the present time.

We therefore welcomed the opportunity recently to see what has been done, and is being done, in this direction by the Igranic Electric Co., Ltd. This company is not a cooker manufacturer, and a result of bringing fresh minds and ideas to bear upon the problems of electric cooking is the suggestion of a number of modifications of a decidedly interesting character for practically every type of cooker.

All the proposals are born of close research in electric cooking based on a belief in automatic control, from which point of view the company claims to be in a particularly favourable position for investigation and advice because of its specialisation in all kinds of electric control problems for many years.

Having once decided that automatic control of cooking had to be faced and that it was definitely advantageous because it permitted the cook to leave the food entirely under the care of the equipment, and having produced the early single-step "Thermentor" control unit, the company was faced with many problems bearing on cooker design in order to find out the most satisfactory applications of automatic control.

Rapid Initial Heating

One of the first problems presented was to find the correct loading for any given size of oven, and the conclusion arrived at was that 1,500 W or 1,600 W per cu. ft. was desirable for initial heating, whereas about 900 W per cu. ft. seemed sufficient for the period of actual cooking. This maximum loading appears to be higher than is generally adopted at present, but it is considered essential to afford quicker initial heating up.

For this purpose Igranic have developed the two-step or dual system of control for which they claim much closer temperature regulation and consequently better cooking and economy in consumption than with the previous single-step control.

With the dual system the oven elements are divided into suitably proportioned sections, both of which are used for initial heating. As soon as the desired cooking temperature is reached one section is automatically cut out and cooking heat is subsequently maintained by automatic control of the remaining section. This would seem to provide a definite safeguard against the over-cooking which discourages new users of electric cookers, and it is important to ensure that food is not inserted in the oven until the correct temperature has been reached. For this purpose an indicator lamp is provided in the "Thermentor."

It seems clear that if automatic temperature control is to be advanced many advocates of electric cooking will have to consider a new technique. That is not so serious as it sounds. In its propaganda the industry has stressed cooking on a falling temperature curve, advantages of radiant heat for sealing the exterior pores of meat for juice preservation, the advantage of the thermometer and the great importance of residual heat. The first and last points are associated.

The Cook's Point of View

Miss J. Freeman, who has been responsible for the practical cooking side of the Igranic researches, is emphatically of the opinion that the highest standard of cooking results from constant temperature. She says that in most cases of hand control the limits of three-heat switching made this ideal too difficult and troublesome for the average user to attain.

On the question of radiant heat sealing up the pores of meat, Mr. S. R. Wright, who is looking after the technical side of the researches, said he had no fault to find with this, but that the point that really seemed to matter was correct initial temperature which would give the same result whether the heat was radiant or otherwise. This has considerable bearing on the question of total loading and also on internal air circulation, the importance of which we shall presently see in conjunction with an associated development.

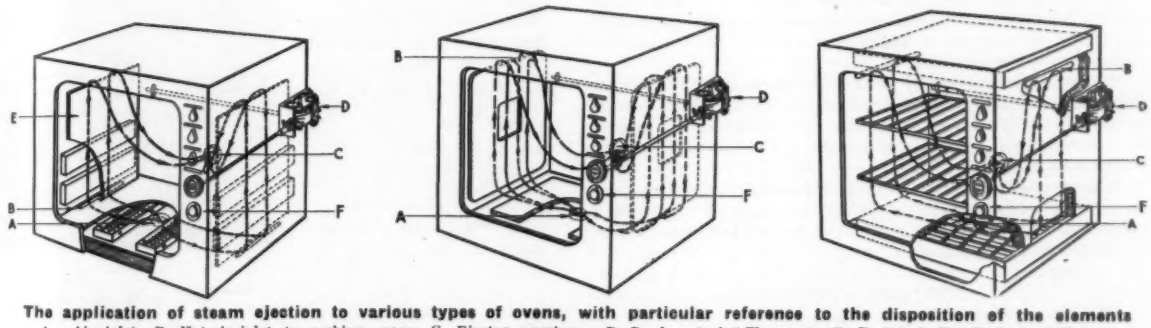
It is probably true to say that thermometers on cookers do not give accurate readings, but we cannot see eye to eye with Igranic when they talk of the "uncertainty of thermometer cooking." We agree that a thermometer in the oven door reads only spot temperature, that its reading is affected by cold air currents and by condensation on the bulb, but we know of very many instances where the introduction of a thermometer has meant a definite advance in cooking practice.

As we see it the greatest obstacle to automatic control, if it has to come, is the apparent necessity for the modification of existing design, mainly in respect of the location of the thermostat in relation to the elements, their fixings and general oven housing, and of the lagging.

TOTALLY ENCLOSED OVEN WITH BOTTOM AND SIDE ELEMENTS AND SIDE BAFFLES

TOTALLY ENCLOSED OVEN WITH BOTTOM AND SIDE ELEMENTS OF PANCAKE TYPE

TOTALLY ENCLOSED OVEN WITH TOP AND BOTTOM ELEMENTS AND SIDE FLUES



The application of steam ejection to various types of ovens, with particular reference to the disposition of the elements

A. Air inlet; B. Hot-air inlet to cooking space; C. Ejector aperture; D. Dual control "Thermentor"; E. Side baffle; F. Lamp indicator.

Placing the Thermostat

Because of stored heat in the various components it is often the case, we were told, that the oven (or its components) controls the controller (thermostat). The company claims that a reduction in the weight of lagging and porcelain element supports materially improves the operation of the cooker, providing everything is done with a proper understanding of what is required for correct cooking. From its test results on many types of cookers the company holds that the most desirable common position for the thermostat is at a point one quarter down from the top at the back of the oven. Correct position is regarded as an essential factor in proper regulation.

Steam Ejection

The extensive research already referred to has led to something more startling—steam ejection—which is really a special form of ventilation. Shall we be able to say that it is the solution to the irksome ventilation problem? The steam ejection system aims at the scientific and controlled circulation of hot air within the oven, so displacing excessive steam and cooking fumes which are ejected through an aperture at the lower part of the back of the oven. Talking of ventilation, Colonel B. I. Rolling asked us why some oven doors were machine faced while holes were permitted at the top of the door, sides and back of the oven to let the heat out. We couldn't tell him.

Practically every type of cooker demands its own application of the principles of steam ejection, but the simple arrangements common to all types are an air inlet beneath the lower elements which are selected as the standard maintaining heaters and the ejection aperture slightly above these heaters. The stream of heated air passes upwards, remaining close to

the sides and front of the oven, and then passes downwards near the centre of the oven, finally to pass with the fumes and water vapour through the exit aperture at the back.

The absence of the usual rush of steam in the cook's face on opening the oven door is one very appreciable advantage of this system, but the company stresses more particularly the importance of controlling oven humidity as an aid to better cooking. Some adaptations which have been evolved for various types of cookers, including those with top and bottom heating, side heating, side and bottom heating, and "internal" and "external" heating, are depicted in the accompanying sketches.

All cookers have their own individual characteristics, and while there is a scheme for every type of cooker, it seems to us that the company favours bottom heat with a low top heat in the ratio of four to one. Indeed, some bottom heat, if only auxiliary, seems essential. For instance, we actually saw on test a breakfast cooker with a small heater at the front bottom to induce circulation and a false bottom underneath. To see a 4½-lb. joint cooked in so small a cooker was impressive indeed, and Miss Freeman assured us that such a result could not possibly be obtained with hand control in that class of equipment. But more interesting still, perhaps, is that in this converted equipment there is the still further development of automatic oven and hot-plate simmering control.

Without steam ejection automatic operation of this unit was found to be very erratic on test. After steam ejection was applied the oven heated up very rapidly but water on the boiling plate would not boil (the boiler griller of this cooker serves for oven heating and no baffle was used). Experiments with a top baffle produced excellent results from a black baffle with two ½-in. slots near the sides for air circulation.

A perusal of consumption and temperature curves from tests on many types of cookers reveals that there is very little difference in the operation temperatures afforded by equivalent loadings with both sealed ovens and steam ejection, and that both heat and shrinkage losses due to steam ejection are negligible. The greatest difference is in the initial heating up and in some cases the time with steam ejection is shown to be 25 per cent. quicker than with the oven sealed. Another important point shown by the tests is that evaporation is not increased with steam ejection.

Frequency Changers for High-speed Motor Drives

By A. G. Powell, A.M.I.E.E.

THE adoption of built-in motors and direct drives has led to the development, for use on certain types of machinery, of three-phase induction motors running at considerably higher speeds than those obtainable at the standard frequency of supply. The maximum speed obtainable at 50 cycles is 3,000 r.p.m. (less slip), while for certain applications motor speeds of up to 12,000 r.p.m. are desirable, to obtain which it is necessary to employ high frequency, generated by the use of either a motor-alternator set or an induction frequency changer.

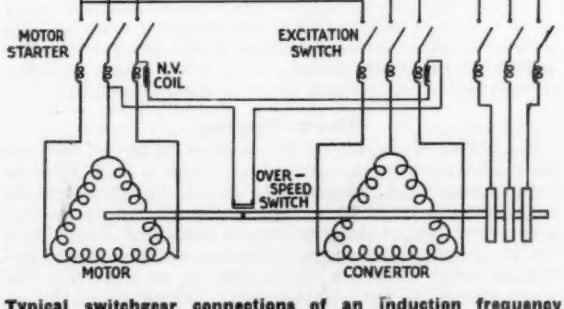
While possessing several minor disadvantages the induction frequency changer has much to commend it. The principal points in its favour are low first cost, compactness, ease of operation, and general simplicity of construction and switchgear.

The frequency changer itself is identical in construction to a slip-ring motor, and the usual arrangement is to couple it direct to the driving motor, the two units being mounted on a combination bed-plate.

Theory of Operation

The theory of operation is simple. If a slip-ring motor is held stationary the induced rotor currents will be at the same frequency as the supply. If, now, the rotor is rotated in a direction opposite to that of the stator field, the frequency of the rotor currents will be increased to a value which is the sum of the frequencies of the stator (excitation) current and that due to the rotation of the rotor, its actual value depending also upon the number of poles of the convertor.

It is usual to employ the stator winding as the primary (field) and the rotor as the secondary, the high frequency



Typical switchgear connections of an induction frequency changer

current being taken from the slip rings. Expressed as a formula this is $N=120\ (f_1-f)/P$, or $f_1=N+P/120+C$, where N= r.p.m. of rotor, P=number of poles of convertor, f=excitation frequency, and f_1=output frequency.

Obviously, for minute increases in frequency the changer will have to run at very low speeds. The smallest increase in frequency for which it is practicable to use an induction frequency changer is 125 per cent. For smaller values this type of machine will have a comparatively low efficiency, and ventilation may present difficulties.

The size of the driving motor required for an induction frequency changer is small compared with that for a motor alternator, as in the latter case the motor must supply the full output together with the losses, while in the case of the former the motor only supplies a small proportion of the output, depending upon the difference between the input and output frequencies. Neglecting losses, the power required for the driving motor is $P_2=P_1 f_1-f/f$ and $P_1=P\ f/f_1$ where P= power output of convertor, P_1=power supplied electrically by excitation and P_2=power supplied mechanically by the driving motor.

[*Elliott & Fry*

Mr. A. G. Powell

As the excitation voltage is constant there is no means of adjusting the output voltage, and it is therefore essential that the regulation of the machine shall be good. In practice the maximum voltage drop between no load and full load should be not more than 15 per cent., and frequency changers are usually designed to deliver the nominal rated voltage at three-quarters of full load. The regulation depends, in part, upon the constancy of speed of the driving motor.

When an induction motor is employed this condition cannot be met, and in such a case there will be a drop in voltage proportional to the slip of the driving motor. For the same reason there will be a slight variation of the frequency.

Required Safeguards

For induction frequency changers it is essential that, in addition to overload protection, means shall be adopted to safeguard against overspeed, because machine "motoring" is possible under certain conditions. Should the secondary (rotor) circuit be completed through any connected motors, and the excitation circuit (stator) be closed, failure of the driving motor would result in the frequency changer itself running in the reversed direction as an induction motor and perhaps reaching a dangerous speed.

The same condition, of course, might be reached by incorrect sequence of switch operation, either when starting or shutting down the plant. The usual means of obviating any danger in this direction is to incorporate suitable interlocks in the switchgear so that the excitation switch is closed last and opened first. An additional precaution is the provision of a centrifugally operated overspeed switch on the machine connected in the no-volt release circuit of the excitation switch.

The correct order of switch operation when starting the machine is to (1) close the isolating switch, (2) start the motor, (3) when up to speed, close the excitation switch, and then (4) close the high-frequency line switch.

The operation of induction frequency changers in parallel can be successfully accomplished when the machines have identical characteristics, so that the load is evenly shared. Synchronising is not necessary.

Good Workmanship. By H. R. Taunton, A.M.I.E.E.

How good installations are made or marred

THE first of the new I.E.E. Rules—" Good workmanship is an essential requirement for compliance with these Regulations "—is really the most important of them all, although, curiously enough, this is its first appearance in them. It is not to be found in the ninth edition. One can imagine the compilers debating whether it were worth while including it in this; for, excellent rule as it is, it suffers from two disadvantages. It is so obvious that everyone will take it as read; it is so indefinite, so unavoidably indefinite, that everyone will put his own interpretation on it.

It may seem, then, no more than the expression of a pious aspiration. It has, however, a value greater than that. Its inclusion as an integral part of the Rules has the useful effect that any contract in which compliance with the I.E.E. Wiring Rules is made an essential condition may be invalidated by a proved breach of Rule 1, notwithstanding the apparent observance of every other rule.

That is a quite possible eventuality. The remaining rules are only concerned either with specifications of the materials to be used or the conditions under which they are to be used, and not at all with the details of the workmanship necessary for their best use. A contractor may give his men all the best materials, complying in every way with the relevant rules, and yet bad handling can make them of no more worth than the shoddiest products of the Continent or the Far East. Further, he may insist on his men obeying the last letter of the Rules, and the consultant may by unremitting supervision satisfy himself that they have obeyed them, and yet be confronted in the end with an ugly, ill-finished job, full of almost intangible defects and potentialities of disaster, not discoverable by any of the specified tests on completion.

Judging by Appearances

The Rules are not concerned, of course, with the appearance of an installation. A good appearance, however, is one result of good workmanship, and failure to obtain it, in normal circumstances, may therefore safely be taken as a sign of bad. Moreover, and more important, if work done on what shows on the surface is bad, it is a fair assumption that the work done on what doesn't show is at least equally bad. And the converse is generally, though not always, true.

There is nothing in the Rules, for example, insisting that conduits shall be run parallel to adjacent lines and that blocks or switchplates shall be square with their surroundings, or prohibiting ugly sets and clumsy, badly spaced boxes; nor, naturally, do they condescend to such trifles as the painting of exposed threads or the use of the right type and size of screw.

The man who is slovenly in these points which make for good appearance will certainly be slovenly in those others, less open to view, which make for a sound, trouble-free job, although they, too, are necessarily disregarded by the Rules. He will not swab out his conduits to clear them of moisture, oil and grit; he will bruise and kink his cables in drawing them in; his connections at terminals will be slipshod, with too much bare copper and with braid touching porcelain; his bonding will make shift to pass the first continuity test and presently break down under corrosion or vibration: in short, if he doesn't take enough pride in his work to make it look good, it will be in essentials as bad as it looks.

Different Points of View

All this, possibly, notwithstanding the fact that he is, under the compulsion of his employer's or the consultant's supervision, literally complying with the Wiring Rules. The probability is, of course, that, being the slovenly fellow we are assuming, he will ignore or evade as many of them as he can. In any case, however, he is breaking Rule 1, and the contractor responsible for him can be made to suffer accordingly—if the workmanship is so bad as to be beyond dispute.

Therein lies the difficulty. It will never be so bad as to be beyond dispute by some contractors, and it will rarely be so good as to satisfy some finicky consultants. Between the two extremes of " gold-plated " and utterly shoddy there are as many standards of workmanship as there are workmen. Every consultant has his own ideas, and an installation that one would pass as " sound, if a little rough " another would condemn off-hand.

When we come to contractors, and so-called contractors, we find standards varying from the plus of Victoria Street to minus everything. For many it is zero: they have no standard other than the scraping of a profit from the job. If their estimate has left them a sufficient margin, they *may* temporarily adopt a plus standard; but if, more usually, it is a cut-throat one, their standard sinks automatically to that of the cheap labour they find themselves forced to employ. It is, in fact, the contractor who is responsible for the standard of workmanship on his jobs, and not his men. Good, average, or incompetent, he gets what he deserves, what he pays for, and presumably what he wants.

Why London Stands High

Standards vary not only with individuals but with districts. It is, for instance, generally agreed that the standard of electrical wiring work is higher in London than in the provinces. It is high, too, in Scotland; at least, it was when I was doing contracting work there at the beginning of the century, and, though I have had no personal experience of it since, I am told the standard there is still comparable with that of London. In the English provinces, however, the standard is definitely lower. I am speaking in averages; there are, of course, shining exceptions, and any reader who may be aggrieved by the comparison may take it for granted that he is one of them.

It is only natural that the London standard should be comparatively high. There are more large and important buildings to be wired; there are more contracting firms of long experience and repute competing for the wiring of them; and there are more public bodies and consulting engineers to see that they are wired in the best possible manner. Moreover, what is perhaps the greatest contributing factor—and this is another opinion which may be disputed—the E.T.U. is stronger in London than elsewhere.

All the best firms engaged in the contracting industry have agreed, and others have been virtually compelled, to employ electricians at fixed trade union rates. That being so, they naturally see to it that they get the best value possible for the 1s. 10d. an hour, or whatever it may be, that they have to pay. They tend to select and retain the better men, weeding out the careless and less skilful. Having got their good men, they train them and encourage them to give of their best; some in pursuance of a worthy ideal; all from a natural commercial instinct. And so, helped by the activities of various training centres and the efforts of the men themselves, the average standard of workmanship throughout the whole trade has been gradually but perceptibly raised.

The Diversity Factor

As we have the Wiring Rules open at page 10, we may as well glance at the remaining three rules under the heading of " General." Nos. 2 and 3 are simple and straightforward, and need no comment. The interesting one is No. 4, which recognises for the first time the use of a diversity factor in calculating the sizes of mains and sub-mains. This has, of course, been the common practice of contractors dealing with large installations, such as blocks of flats, where it has been safe to assume one, particularly for heating and cooking.

The determination of a suitable factor has always been largely a matter of guesswork, corrected slowly by experience. We are now given a table (Table 1, p. 109) which, insomuch as it is the result of the experience of many, will be found a useful guide. It is not intended to be anything more; it is in no way binding, nor can it be applied blindly, without regard to differing circumstances.

Take, for instance, a block of twenty-four flats, each equipped with a 6-kW cooker. According to Table 1, the diversity factor for the cooking main can be calculated on 100 per cent. of the full load of the largest appliance, 50 per cent. of the second largest, 33⅓ per cent. of the third, 25 per cent. of the fourth, and 20 per cent. of the rest. For twenty-four cookers, all of 6 kW full load, that would work out at 36.5 kW, or a diversity factor of practically 25 per cent.

That would do very well if the flats are such as have tenants likely to be often away from home, or accustomed to dining out at frequent intervals. It would clearly not be large enough for a block of cheaper flats, where a large majority of the tenants might be expected to cook their Sunday dinner at much the same hour all the year round. And again, of course, the factor would need modification up or down according to whether the number of flats in the block were small or large. The table, therefore, must be used, as it is put forward by the Wiring Rules Committee with the reservations of common sense.

Salaries and Grading. By D. Shipton Wood, A.M.I.E.E., A.M.I.Mech.E.

The classification of power station staffs

WHEN the revised schedule of salaries was issued to the members of the Electrical Power Engineers' Association, I think many must have felt surprised that the old anomalies of the grading remained as before. Surely it is time that the many positions in the electricity supply industry were allotted definite grades, and that some positions were regraded—particularly that of shift charge engineer.

The grades were laid down many years ago, when conditions were very different from what they are to-day. I fully realise that it is difficult to grade every position but undoubtedly there is room for much alteration and revision, which is not only possible but essential.

Generally speaking, the only positions that are graded are deputy chief engineer, chief assistant engineer, mains superintendent, power station superintendent, assistants to these last two engineers, shift engineers, and junior assistants. This may have sufficed some years ago, but to-day there are very many more positions than there were ten or fifteen years ago, and many members do not know to what grading they have claim. Then again, what is meant by "deputy chief engineer," and "chief assistant engineer"? Are not these designations rather vague?

Many years ago it was possibly essential to have a deputy chief engineer, but then undertakings were more or less a one-man job. Men in subordinate positions were small fry, and there had to be an all-round engineer who could take charge of the undertaking in the absence of the chief; "all-round" engineers were very scarce and consultants were in great demand. Things have altered and the modern school is very different from the old one and there is not the scarcity of electrical engineers that there was in the infancy of the industry.

The "Deputy"

One does not see deputies appointed for every position of importance in other professions and industries; when the manager or chief official is absent, someone deputises for him as is becoming the fashion in the electrical industry. Electricity supply undertakings now tend to appoint either a chief assistant, or chiefs of departments; in the latter case, one of these departmental heads deputises for the chief engineer in his absence.

That the "deputy chief," or even the "chief assistant," vogue is dying out is evidenced by the fact that undertakings are appointing technical or personal assistants, to assist the chief engineer, who, with the various departmental heads, share the work of the chief assistant, each man being a specialist in his own branch of the industry. What is the grading of such positions as personal assistant, technical assistant, generation engineer, efficiency engineer, boiler house shift engineer, boiler house or turbine room operation engineer, mechanical or electrical superintendent, etc.?

Then again, there is the case of an undertaking which has an engineer and manager who has his secretary. Is the so-called chief assistant responsible for the secretary's work, or is he merely chief technical assistant? If the latter, then what is his grade as distinct from the chief assistant who is responsible for administration? Further, what about the commercial engineer—a very vague term? Sometimes he is known as consumers' engineer and his duties are of a different character in different undertakings.

Mains and power station superintendents' duties vary considerably. In the case of the power station superintendent some undertakings have a generating, or generating stations, engineer; some do not and yet the grading of the superintendents is identical, although the duties and responsibilities are very different.

The Shift Engineer

Consider the shift charge engineer, whose duties vary greatly in different stations. I realise that a grade to suit individual stations is an impossibility, but in view of the multitudinous duties falling to the lot of the average shift engineer surely he is entitled to a grade above 8. Some years ago the shift engineer's duties and responsibilities were nothing compared with what he has to do to-day: he must not only be an electrical and mechanical engineer, but must be versed in the theory and practice of efficient combustion to a very much greater extent than formerly.

In the absence of the superintendent he is not only responsible for continuous supply and care of plant, but for the keeping down of the station costs. In many stations he has practically no assistance in the boiler house beyond his fireman, so that much depends on his personal knowledge of combustion; yet he is paid the same salary as men with fewer responsibilities in outside departments, and given little encouragement to keep down his fuel costs on which, to a great extent, the success or failure of an undertaking depends.

These are only a few of the anomalies existing in the Joint Board Schedule—there are many more too numerous to mention. It must be remembered that an undertaking is now run by the technical staff, from the top to the bottom; the chief engineer is the administrator, and "consultant." In the old days the supply undertakings were run by the chief engineer and an outside consultant, who told the staff what to do, and how to do it.

To-day is the day of the specialist, and for this reason many new positions have been created, and are being created, and it is incumbent upon the E.P.E.A. as the professional association, to ensure that these new positions shall be definitely graded, also that positions entailing greater responsibilities than formerly shall be regraded accordingly.

Sorting Them Out

It appears to me that the whole question of designations, duties and grading should be gone into very thoroughly by the National Joint Board, so that members of the E.P.E.A. may feel sure that whatever their position and their duties, there will be a suitable grading in the Schedule. Further, in the event of there not being a grade definitely allotted for what may be an exceptional position, the District Joint Board should decide on the grade, or salary, for the particular case. Perhaps, in time, the E.P.E.A. will be able to lay down, in conjunction possibly with the Electricity Commissioners, exactly what officials shall be appointed to an undertaking, and what their designation shall be.

The E.P.E.A. is of the greatest possible help to engineers of the electricity supply industry, so much so, that no man engaged in the industry can possibly afford to refrain from membership if he is qualified; but there is discontent amongst its members, and will be until it goes very closely into the grading of the various positions, which, at the moment, is very far from perfect.

Lighting Development in America

LIGHTING development in the U.S.A. was the subject of an address delivered to a group of supply engineers at the E.L.M.A. Lighting Service Bureau last week by Mr. G. B. Regar, manager of the Lighting Sales Department (one of the largest in the U.S.A.) of the Philadelphia Electric Supply Co., and president elect of the Illuminating Engineering Society of America.

Mr. J. Y. Fletcher presided and remarked that that was the first meeting to be held in the Bureau's new demonstration lecture theatre, which would be ready for official opening at the end of August. The premises they had temporarily occupied since the fire had been vacated in June.

Mr. Regar prefaced his address by remarking that neither in Germany nor France, where he had recently been, was there anything to compare with the E.L.M.A. organisation, which was doing some things even better than its American equivalent.

In the paper he had read at the Berlin conference he had heartily agreed with the conclusion reached by Mr. Bruno Seeger (who had analysed lighting load conditions in Europe) that increased consumption for lighting did not sharpen the peak, but acted for the betterment of the station load.

The lighting load would never become a by-product relative to the power and domestic loads, and its magnitude in no way approached that warranted by its potentialities. The use of more light, particularly in the home, could be accomplished without the expenditure by the consumer of money for additional lighting equipment.

The development of the lighting business warranted the greatest promotional effort in order to foster and accelerate a more thorough lighting consciousness, and in such activity merchandising principles must be utilised to ensure its fullest realisation. Mr. Regar described in some detail how the principles he advocated were being put into practice by the Philadelphia Company and other organisations in the U.S.A.

Mr. J. Y. Fletcher, in proposing a vote of thanks, which was seconded by Mr. W. F. T. Pinkney, emphasised the importance of lighting sales promotion propaganda, remarking that the tendency toward a rapprochement between E.D.A. and the manufacturers would be welcomed by the manufacturers.

Chest Radiography Equipment

AT the showrooms of Messrs. Watson & Sons (Electro-medical), Ltd., Parker Street, Kingsway, W.C.2, we recently inspected the "Rotalix tube plant" which has been designed to produce "standardised" chest radiographs of increased diagnostic value at greatly increased speed.

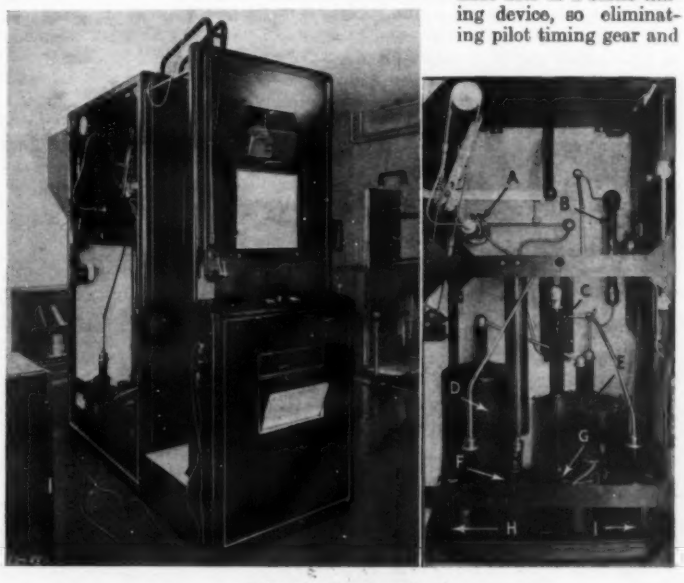
Thirty to forty patients can be screened and radiographically examined in an hour, and the exposure conditions at any one time can be reproduced precisely months afterwards. These results have been brought about directly mainly by the elimination of all but one of the operating variables—kilovoltages—and indirectly by the reduction of distortion and imperfect definition to a minimum as the result of a changed outlook on the question of exposure time.

It was explained that very little reduction in distortion is attained by increasing the focus-film distance beyond about five feet, and that the greatest sharpness is obtained when the geometric "unsharpness" (due to focal spot dimensions) is equal to twice the unsharpness due to movement of the patient. Values of geometric unsharpness (Ug) and movement unsharpness (Um), plotted graphically, show the reduction in exposure time beyond 1/30th second results in loss in definition.

The equipment consists of a well-proportioned cabinet in which the whole of the electrical components are enclosed, with a division at the front for vertical radiography or screening, and an extension at the back for radiography in the prone position. Great attention has been paid to simplicity of operation, and all the controls are grouped on a panel in front of the fully protected screen. The fluorescent screen is always situated at the operator's eye level, and the patient is brought into the correct position by an electrically operated elevator behind the screen, or between the screen and the cabinet proper.

The screening tube is movable in two planes, and can be centred on any part of the screen by a handle at the operator's left, which also accommodates the slot diaphragm controls. In its extreme left position the "Metalix" screening tube is out of circuit, and the plant is "set" for radiography. Exposure is made by a hand switch and is maintained electrically at 0.03 second, adjustments for different patient thicknesses being made by varying the kilovoltage. From an ordinary mains supply of only about 15 A, the "Rotalix" tube is operated through a small h.v. transformer, a "Metalix" valve, and a large condenser.

To prevent voltage drop with condenser discharge there is in circuit with the tube an oil-immersed inductance. This so modifies the wave form that the voltage remains substantially constant during the exposure. Further, the inductance acts as a static timing device, so eliminating pilot timing gear and contactor switches, which are always potential sources of trouble.



"Rotalix" tube plant

A, "Rotalix" tube; B, screening tube; C, valve; D, h.t. condenser; E, h.t. inductance; F, insulating transformer for "Rotalix" tube stator; G, h.t. transformer; H, valve filament transformer; I, tube filament transformer

The rotor and filament of the "Rotalix" tube are automatically switched on when the condenser commences to charge, so that it is impossible to damage the tube by incorrect operation sequence. A shaded striplight illuminates the control table and another throws light upon the patient; both are controlled by a switch on the handle of the tube guide.

Electrical Gear for Planers. By "Designer"

CONSIDERABLE skill is required in the design of electrical gear for large planers. The main requirements are that the control must automatically and accurately govern the operation of the planer and make available several speeds each separately adjustable for cutting and return. The motors must be sturdy enough to withstand heavy duties and strains due to the frequent table reversals.

Accurate adjustment must be provided for giving a variety of cutting speeds from, say, 25 to 60 ft. per minute on standard planers using a four-to-one speed range, and lower speeds on six-to-one speed range motors. Separate adjustments are required for return strokes, varying from 50 to 100 ft. per minute on a four-to-one speed range and up to 150 ft. per minute with six-to-one range motors.

Modern Practice

Service conditions call for special features. The best modern practice is to build the shells of the machines of rolled or cast steel of ample cross section to give extra mechanical strength. The feet have large machined surfaces, as accuracy of mounting is necessary, while the armature is made long and of small diameter to reduce the flywheel effect and the time needed for reversal. This means that the frame itself is longer than that of a standard machine.

The coils in the armature require special attention, and (if the core is banded) extra banding is required to prevent the coils springing when the motor is suddenly reversed. This extra banding means a hotter armature, as the air cannot circulate so freely through the core. Consequently, the rating of the machine is reduced as compared with that of a standard motor.

Instead of banding it is better to secure the coils in the slots with bakelite wedges up to 5 mm. in depth. These are held in position by notches in the top of the slots and positively retard any movement of the coils which tends to chafe and wear the slot insulation and is a frequent cause of breakdowns.

Commutators should be of liberal size, with extra wearing depth and of bolted construction. The brush gear must be sufficiently strong to withstand vibration, while the armature shafts should be of high-tensile steel of sufficient diameter to provide a strength of 30 per cent. in excess of the equivalent standard motor. The shaft is required to withstand the stresses due to frequent reversals. The pressure of oil-ring journal bearings should not exceed 30 lb. per sq. in.

An enclosed automatic control panel is usual, being provided with a shunt regulator to adjust the cutting and return speeds. Ease of access to the terminals and dustproofing are necessary. The reversing contactors are of carbon to obviate fusing of the contacts.

It is usual for the driving motors to start with full field, automatically accelerating to a speed which will correspond to the regulator setting. A pendant push-button box is fixed on the machine having two "inch" buttons and a "start" and "stop" button. In this way the planer can be moved $\frac{1}{16}$ in. or the whole length of the machine.

Centralised Control

The control of all operations is localised at one point. The reversing master switch is mounted on the bed and is operated by the stops on the travelling table. This settles the length of travel. The master switch also controls the pilot circuits of the magnetic reversing contactors in the control panel which stops and reverses the motor at the end of each stroke. Time-limit overload relays protect the gear, and low-voltage protection is also afforded. The machine is stopped if the relays operate by dynamic braking and cannot be restarted without the "start" button being pushed.

Electricity in Factories

How accidents can be avoided

THE report issued annually by the Home Office entitled "Electrical Accidents" is now avaiable for 1934 (Form 929, Stationery Office, 4d.).

The Senior Electrical Inspector of Factories, Mr. H. W. Swann, shows that reportable accidents (those causing more than three days' disablement) numbered 380, including 31 fatal. The average for the previous five years was 352, and in 1924 (when the kWh sold was under five million as against over twelve million in 1934) the figure was 433. In addition there were 50 fatalities known to have occurred outside the Department's province. Twenty of these occurred on domestic premises and four of them happened in bathrooms.

Skilled men were involved in 122 accidents (18 fatal) and youths under 21 years of age in 57 accidents (two fatal). Accidents to women occurred due to the failure of flexible on electric irons due to heat and bending. Rubber tube for the protection of the leading-in wire is often more suitable than a wire spiral, which generally requires to be earthed.

[Elliott & Fry.

Mr. H. W. Swann, Senior Electrical Inspector of Factories

Switchgear was responsible for 111 accidents (nine fatal), 22 per cent. of which were at more than 650 V. The use of barriers between bare conductors of opposite polarity would eliminate certain causes, especially where space is cramped. Misuse of motor or other control apparatus is a recurring source of accidents. Push-button control which takes the sequence or speed of operation out of the hands of the workmen would often be of advantage.

Defective earth connections were the chief cause of the 42 accidents (two fatal) with portable apparatus. Periodical tests of the earth circuit are most desirable. Several accidents indicate the need for more attention to cord grips to guard against wires being pulled out of terminals. The need for careful supervision and protection of bare trolley wires is demonstrated by the ratio of four fatal to nine non-fatal accidents in this group. One cause is the use of crane controllers in three-phase circuits that break on two phases only.

The liability to error of qualified persons is shown by one case in which a 200-V voltmeter was connected across a choke coil coupled to the 6.6-kV side of a transformer; the tester forgot that the coil and instrument were alive at high voltage and was severely burned. Readings are now observed through a telescope. A fire in a cotton mill was attributed to the bursting into flame of a workshop flexible, suspended from a ceiling rose near the lampholder that it was supporting. Among the instances cited of explosions is one in which ebonite dust was ignited due to a short-circuit in the exposed coils of a magnetic separator.

Safety in Sub-stations

The report points out that the Factory Regulations are applicable to sub-stations; this is to clear up any doubt that may have arisen from the High Court finding on an individual technical issue. The number of new sub-stations constructed for supplying industrial concerns is considerable but markedly less than those for general public supply. Expensive underground sub-stations with space limitations and lack of flexibility to meet extensions are often unavoidable. In rural districts kiosks predominate; usually these are equipped with open type switchgear. Fencing is often inadequate.

One undertaking has designed a roof structure for erection over some of the larger outdoor equipments to prevent trouble due to admission of water into h.v. switchgear. The top cover is fitted with hooks round the eaves for the support of side sheets when work is necessary in wet weather. Metal screenwork fitted between sections provides an effective barrier for limiting arc spread.

Master-switch control of groups of lower rated switchgear is used by many undertakings. Generally an interlocking scheme delays the action of the smaller units until the master has cleared the group. The thermal rating of current transformers is usually on a half-second basis, but sometimes two seconds appears to be allowed to correspond with similar switch settings. A scheme of rating that refers the safe carrying capacity to the time setting of protective devices is required.

The wisdom is questioned of bonding h.v. cable sheathing, aerial earth lines, or the metal casings of h.v. apparatus to an electrode that is employed with the neutral conductor of a distribution system, in view of potential rises on the latter following trouble on the h.v. side. Where normal earthing methods are supplemented by a sensitive earth-leakage trip, the latter should be connected to a separate earthplate situated as far as practicable from the main electrode. Such leakage trips should operate with a rise of not more than 50 V with at most 30 mA.

Protection of Motors and Cables

Cast-iron enclosures of motors and switchgear are generally resistant to corrosion in industrial atmospheres, but sheet steel (which is becoming increasingly common) often rapidly deteriorates. The effect of corrosion is greatest on the protective covering of cables, especially conduit. Wrought-iron barrel is probably more resistant than thin-steel conduit even when galvanised. In bad situations a cheap steel with a percentage of copper could probably be used with advantage.

Dry frosty weather or a dry, clean atmosphere due to air conditioning are favourable to the retention of static charges which should be dissipated by earthing. In one case sheets of metal on dry wood stands acquired a charge sufficient to produce a quarter-inch spark—a dangerous condition when using cellulose paint.

During the past three years eighteen fires have been investigated in dry cleaning works; nine of these were due to the ignition by static electricity of the inflammable washing liquids. Explosions have also occurred in washing machines but the way in which charges can be built up internally is at present largely a matter of conjecture. Fires have occurred in dry-cleaning works, however, even where such measures have been adopted as earthing, humidification, the use of conducting soaps or of non-inflammable washing solutions. Further research on the subject is called for.

Means adopted for mechanically actuating travel-limit switches are sometimes unreliable, prominent weaknesses being their dependence upon a spring without an effective backing-up motion or upon wire ropes in pulleys which may jam if the flanges are worn. Accidents have also occurred with bicycle-chain limit drives when too much lash has been allowed to develop.

The applications of electric welding continue to increase, but it remains one which is rarely associated with an electrical fatality. In connection with the cases of conjunctivitis reported it is noted that the persons actually welding are seldom affected by the arc ray, no doubt because the work is such that the use of screens and special glasses is essential. During the last three years thirty-five cases of eye trouble were reported, and, of course, a much larger number occurred which did not incapacitate for the statutory period.

Three fatalities in connection with temporary installations for civil engineering contracts came to the notice of the Department during the year, due to insufficient mechanical protection of wiring and apparatus.

Protective Glasses for Welding

EYE protective glasses are used by operatives in industrial work involving exposure to radiation of high intensity, in order to avoid straining or damaging the observer's eyes. Contrary to prevailing belief, colour is not a factor by which the protective value of a glass can be judged, and it has not been considered necessary to standardise it. In a draft specification, which has been circulated by the British Standards Institution for technical comment and criticism, glasses here, therefore, been divided into five grades, irrespective of colour, according to the proportions of light absorbed by them. The brighter, and in general the higher the temperature of, the object to be viewed the greater is the density of glass needed. Glasses which appear of the same colour and density to the eye, or, in other words, which have the same properties as regards visible light, may have very different properties as regards infra-red and ultra-violet radiations. In the Specification, therefore, limits for the maximum permissible transmission of both infra-red and ultra-violet radiation have been laid down, and a glass which complies with this specification can be ordered by its grade alone, with the knowledge that its transmission of the invisible radiations will be satisfactorily limited.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Improved Service at Sunderland

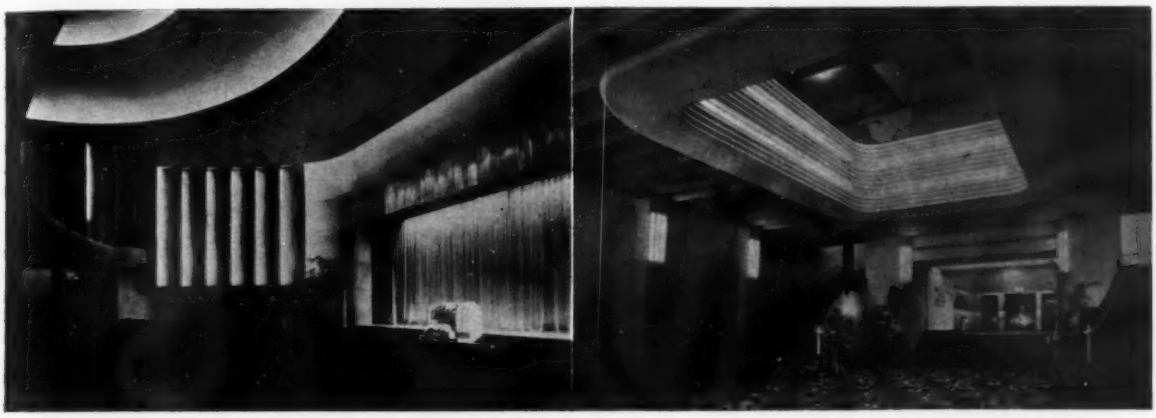
It is with great regret that I notice in the report on page 96 of your July 19th issue that the tariff for factory lighting in Sunderland is one which has been found to hamper development.

The tariff, as readers may remember, is one where lighting is charged at the power rate, namely, 1d. per kWh, up to 10 per cent. of the power consumption, and above that at 3d. per kWh. The natural reaction of the consumer, which has been found in actual practice, is that he will not put up his lighting consumption beyond one-tenth of the power consumption. It is now common knowledge that the higher the value of illumination employed, the longer the period over which it is used, and the better the load factor. There would, therefore, appear to be no justification for a tariff of this sort. If it is thought that it will produce higher revenue from the lighting at the 3d. rate the natural limitation of the lighting consumption to one-tenth of the power will defeat this object, and the result will be a loss of the revenue which would be obtained if lighting loads were allowed to develop normally.

In view of all the most admirable schemes for giving service and thus developing load in other applications, this factory lighting restriction tariff does appear incongruous.

HOWARD LONG, A.M.I.E.E.

London, W.7, *July 29th.*



The auditorium and the vestibule of the "Astoria" Cinema, Southend-on-Sea, showing the modern illumination scheme which has been adopted **(See page 155)**

Domestic Hot Water

Mr. H. Smith's article in your issue of July 26th demonstrates the supply industry's need of trained sales engineers—men with some technical and practical engineering training, and not graduates from clerical staffs.

Why does Mr. Smith ask so many irrelevant questions? For example: "Can it be said that the increase in demand for electricity is due to new consumers or to old consumers using more?" Naturally this depends upon the progressiveness of the particular undertaking concerned. If Mr. Smith is connected with a supply undertaking, then he must know that the accounts and/or statistical department will readily be able to supply the answer to his question.

Perhaps Mr. Smith will renounce his pessimistic attitude towards electrical water heating, when he discovers that many undertakings are installing a great number of immersion heaters, which are giving every satisfaction to their consumers.

To name one instance—Nottingham. This undertaking inaugurated an immersion (circulator) heater hire scheme in May, 1934. By the end of June, 1935, the applications numbered 3,387. This will give Mr. Smith some idea of what can be done when a virile sales policy is adopted by a progressive undertaking.

WILLIAM F. JARVIS.

Bury, *July 29th.*

The I.E.E. Wiring Regulations

In his article of July 26th Mr. E. W. C. Day suggests that legal powers should be obtained whereby the I.E.E. Regulations, after modification, could be enforced. While I am in general agreement with Mr. Day I would point out that unless the scope of the Regulations can be extended to include not only apparatus within a building but in addition the means for conducting an earth current from a building to an earth-plate at the point of supply, such compulsory regulations would not ensure safety.

Mr. Day refers to Regulation 1337 A, which requires apparatus such as cookers to be provided with a terminal to which an earth continuity conductor "may" be connected. I also referred to this matter in a letter some months ago under the title of "Liability for Consumers' Apparatus," and, like Mr. Day, pointed out that compliance with the Regulation would result in a water pipe being employed as the earth conductor.

Obviously the I.E.E. Regulations cannot be applied to water pipes and therefore omit reference to them while implying: "Well, you know what to do about it." Safety requirements demand that a path for the leakage current shall be found and if, for example, a transformer were installed at the site of the installation covered by the Regulations, an adequate earth leakage conductor could be provided and connected to the neutral point of the transformer—probably earthed to the general water pipe system.

The same provision could be made even should a transformer be placed at a site remote from the installation by requiring an earth continuity conductor to be provided between the installation and the earthed neutral point of the transformer, but the I.E.E. Regulations do not cover street cables either and therefore cannot require an earth conductor to be included with the service conductors as an alternative to dependence on water service pipes to complete the circuit of an earth leakage current.

It would be useless asking Parliament to grant powers to enforce Regulations with a view to ensuring safety if at the same time it had to be admitted that the Regulations would not be effective. I would suggest an independent investigation of the many questions involved in the use of the common earth circuit with the object of drawing up distinct regulations which would state what might or might not be done by each distinct party interested in the use of the common earth circuit. Other regulations could then link up with the earth circuit regulations.

A. G. BULLEN.

Liverpool, *July 29th.*

Convector Performance

The attention which is being paid by manufacturers and others to the production of low temperature warming apparatus seems to be giving rise to some very extravagant claims in respect of the performance of the apparatus. Thus, in your issue of July 26th a convector is described for which it is claimed that no less than 200 cubic feet of warm air is discharged per minute at a temperature of 120° F., whilst the loading of the heater does not exceed 2 kW.

Now, if this data is related, as, of course it should be, to operation under normal conditions in a room having a mean temperature of 60° F., it is demonstrably incorrect. In point of fact the air discharged per minute could hardly exceed 110 cubic feet which is only about half the figure given.

CHARLES G. GREENE,
Greene, Phillips & Co.

London, W.C.1, *July 26th.*

The Enforcement of the I.E.E. Regulations

In his article on "Organising a Change-over" in your issue of July 19th, Mr. R. H. Cobbold made the statement that "a supply authority now has power to enforce compliance with the I.E.E. Regulations if it considers such a course is necessary."

It would be interesting to have his authority for this assertion, for curiously enough in your issue of July 26th Mr. Day in his article on the I.E.E. Wiring Regulations appears to

take the contrary view and points out that even in 1935 " only one supply authority out of over six hundred in Great Britain has the legal power to enforce such Regulations within its statutory area of supply."

One would have thought that in view of the remarks of the Electricity Commissioners in their last annual report, the question of the legal enforceability of the I.E.E. Regulations would have been settled, but possibly Mr. Cobbold may not have read them.

Incidentally, in connection with Mr. Day's suggestion that a body representing the supply industry should be formed to obtain the necessary legislation to enforce universal adoption of the I.E.E. Regulations after modification, it might be pointed out that fresh legislation is not necessary. The Electricity Commissioners already have power, if they so desire, to make the Regulations enforceable. So far, they have definitely refrained from doing so.

J. W. THOMAS.

Manchester, *July 26th*.

Industrial Two-part Tariffs

A COMMITTEE appointed by the Federation of British Industries, under the chairmanship of Mr. J. S. Highfield, for the purpose of considering the possibility of obtaining greater uniformity in the basis of two-part tariffs as used in connection with supplies of electricity for general industrial purposes, has recently issued a report indicating its conclusions.

This form of tariff is not recommended or preferred to other alternatives, as for example flat rates, and it is recognised that certain important classes of load can, in fact, only be secured by offering flat rates or block tariff charges. A material proportion of the electricity supplied for general industrial purposes, however, is sold on some form of two-part tariff, and these tariffs show wide dissimilarity in principle (apart from questions of actual price.) They are often imperfectly understood by the consumer and may give rise to much dissatisfaction.

It was felt, therefore, that in cases where two-part tariffs provided the only or accepted basis of charge, a standardisation of the general principles adopted would be advantageous to both the consumer and the supply undertaking. After making a careful survey of current practice standardisation was considered to be desirable in six respects.

As a result of discussions subsequently undertaken with the four associations which represent the supply undertakings substantial agreement has been reached on five of these questions, whilst in regard to the sixth, though there appears to be no possibility of obtaining complete unanimity at the present time, a very considerable measure of agreement has been secured. The position is summarised in the following paragraphs, but some undertakings specify a minimum capacity of the installations to which the conditions should be applicable.

It has been agreed that an integration period of thirty minutes should be employed in the measurement of maximum demand. It is undesirable and impracticable to specify any particular type of m.d. indicator but it is agreed that the instrument used should record with a satisfactory degree of accuracy the maximum average load as measured during successive thirty-minute periods. There is a very large measure of agreement that the power factor adjustment should be applied automatically by measuring the maximum demand in kVA.

The point on which it has not been possible to obtain complete agreement is the period of account during which a charge in respect of the m.d. should continue. A substantial proportion (probably a majority) of the supply undertakings is already prepared to make separate m.d. charges in respect of separate monthly measurements, but others insist that in view of the arrangement between themselves and the Central Electricity Board, whereby their own m.d. charge is on an annual basis, they must reserve the right to charge their consumers in a similar way; in the latter cases it is thought that there may be some relaxation, in actual practice, giving greater latitude to the consumer outside the peak load periods in November, December, January and February, and this concession would be of material advantage in many cases.

The coal price adjustment is to be in accordance with the C.E.B. scale for the particular area concerned with an addition of 10 per cent. for losses in distribution; thus where the C.E.B. scale is at the rate of ±0.0008d. for each penny variation in coal price, the consumer's adjustment would be at the rate of ±0.00088d.

In order to meet the criticism that the conditions of ordinary industrial use should be more clearly specified it has been agreed that the installed capacity of the lighting equipment should not exceed 20 per cent. of the capacity of the whole installation but that within the limit of this maximum capacity there should be a uniform charge for both power and lighting, which can be supplied from one set of mains.

Flame-proof Mining Gear

THE schedule of colliery electrical equipment for which certificates of flameproof enclosure were issued by the Mines Department during the three months ended June 30th, 1935, includes the following:—

Anderson, Boyes & Co., Ltd.—Coalcutters and motor and starter therefor, variation of 100-A plugs and sockets, interlocked with starter.

Belmos Co.—Three-phase and d.c. 100-A 650-V distribution panels with optional fittings and multi-panel coupling; gate-end box, substitution of 100-A plug for terminal box; starter, substitution of 50-A contactor for breaker.

British Jeffrey-Diamond, Ltd.—Squirrel-cage 40-h.p. coalcutter; air-break starting switches and circuit-breakers of several types, 60 and 100 A.

British Thomson-Houston Co., Ltd.—Squirrel-cage motors, driving-end covers modified for vertical mounting; oil-immersed combined stator and rotor starter; d.c. 14-h.p. 650-V motor; high- and low-voltage lighting transformers; air-break feeder switch; oil circuit-breaker.

Cowlishaw, Walker & Co.—" Senior " 650-V a.c. and d.c. 27- and 35-h.p. coalcutters.

Electrical Apparatus Co., Ltd.—Motor control panel variations; air-break 300-A 650-V drum controller.

George Ellison, Ltd.—Four-way 20-A cable link box modifications; 40/60-W well-glass lighting fitting and cable box combinations.

English Electric Co., Ltd.—3,300/500-V lighting transformer with alternative connectors.

Ferranti, Ltd.—Controller voltmeters and ammeters.

Erskine, Heap & Co., Ltd.—Oil-immersed switch variations.

General Electric Co., Ltd.—Oil-immersed 175-A 500-V rotor starter; 50-A d.p. 110-V switch and fuse variation; switch and transformer unit variations.

Hardypick, Ltd.—" Gearless " 1-h.p., three-phase, 100-V coal drill with alternative accessories in substitution for " Flp. 37 " model.

Harland Engineering Co., Ltd.—650-V 250-A slip-ring enclosures.

Heyes & Co., Ltd.—T.p. and d.p. 10/15-A fuse-switch variations; 650/125-V lighting transformer; " Wigan " d.p. and s.p. 10-A 250-V air-break switches with alternative entries; conduit coupling box.

A. Hirst & Son, Ltd.—660-V a.c. 30-A t.p. airbreak switch and fuse with alternative mounting and d.c. interior.

Lancashire Dynamo & Crypto, Ltd.—Various types of cable glands, slip-ring units and enclosures, and short-circuiting gear.

Laurence, Scott & Electromotors, Ltd.—20-h.p. 500-V d.c. motor with external fan for surface cooling.

M. & C. Switchgear, Ltd.—Remote control gate-end box variations; plug and socket variation; oil-immersed circuit-breaker variation.

Mather & Platt, Ltd.—Frame-ventilated s.c. motor, 25-h.p. 500-V, alternative sizes.

Metropolitan-Vickers Electrical Co., Ltd.—Oil-immersed 60-A 650-V combined stator and rotor starter with alternative cable attachments; 500-V three-phase 2.5 and 5-h.p. conveyor motors; 650-V 14-h.p. d.c. motor; 125-A 3,300-V oil circuit-breaker; 150-A 650-V air-break feeder switch; small slip-ring enclosure variations; gate-end box variation; 10-A 650-V cam master controller; controller instruments; lighting transformers for 3,000/105-V and 650/110-V, also for 400/3,300-V input to 25/125-V output, and 300-W auxiliary 500/110-V type.

Protector Lamp & Lighting Co., Ltd.—Magneto and coil and battery relighters for flame safety lamps.

Wm. Saunders & Co.—Air-break switch and fuse boxes of various types and sizes up to 500-V.

Siemens-Schuckert (Great Britain), Ltd.—Three-phase drill transformer, 400/650-V to 125-V with single-phase 125/25-V pilot transformer; drill convertor panel with d.c. 550-V d.c. input and 125-V a.c. output with single-phase pilot transformer.

Standard Telephones & Cables, Ltd.—Magneto telephone generator contacts and receiver switches.

Sunderland Forge & Engineering Co., Ltd.—Air-break 500-V d.c. and 25-h.p. reversing starter.

Switchgear & Cowans, Ltd.—600-V a.c. 100-A air-break gate-end starter; various cable couplers and plugs and sockets; oil-immersed 100-A 660-V gate-end switch.

Allen West & Co., Ltd.—Controller voltmeters and ammeters.

Westinghouse Electric International Co.—½-h.p. 30/250-V d.c and single-phase 100/250-V petrol pump motors.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Carron Fire

The illustration below shows the new "Lounge" fire of CARRON COMPANY, Carron, Falkirk. The full loading is 2 kW. The floodlighted front is available in "Carrontine oatmeal," green or blue, the remainder being chromium plated. The fire measures 20 in. wide by 22½ in. high and 9 in. deep, and the weight is 40 lb.

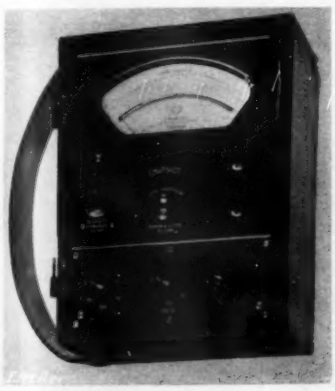
The Carron "Lounge" fire

Unusual Display Signs

Novel and attractive effects for advertising and decorative displays are afforded by the optical system employed for "Rodlite" signs produced by MESSRS. RODLITE, LTD., Golden Hill, Leyland, Lancs. The front of what is essentially a box sign is studded with short pieces of glass rod of various sizes through which the light is projected endwise, so that a picture of spots is presented. This is enhanced by the unlimited effects which can be given by coloured glass, and the value is still further increased by the introduction of flashing, scintillating, and colour changing. In shadow or dark the rods stand out in bold relief, and as each rod is luminous throughout its length the effects vary according to the position of the observer.

A Form-factor Meter

The form-factor meter, which has been designed by the CAMBRIDGE INSTRUMENT CO., LTD., 45, Grosvenor Place, London, S.W.1, in conjunction with Mr. R. S. J. Spilsbury, of the National Physical Laboratory, consists of a thermal voltmeter the indication of which is proportional to the r.m.s value of the applied voltage, and a copper oxide rectifier, giving a deflection proportional to the mean value of the voltage. The same moving-coil indicator is used for both voltmeter circuits, and the r.m.s. voltage across the combination is adjusted by a calibrated rheostat to the standardising value, which is indicated by a red line on the scale when the change-over key is depressed. Upon releasing the key the deflection is proportional to the mean value of the applied voltage, and the scale is calibrated in the ratio r.m.s/mean, *i.e.*, form factor.



Cambridge form-factor meter

The instrument imposes a load of only 10 mA on the measuring circuit and the three-dial calibrated rheostat provides for test voltages from 5 to 257 V, while the indicator scale is calibrated in form factor from 1.0 to 1.5. Voltage readings have an accuracy within 0.5 per cent. and form-factor readings within 0.002.

Welding Electrodes and Rectifiers

To its range of welding apparatus and accessories PHILIPS INDUSTRIAL (Philips Lamps, Ltd.), 145, Charing Cross Road, London, W.C.2, has added a new series of arc electrodes that enable greater welding speed, improved reliability, and a better quality of deposit to be achieved.

The range includes a complete series of electrodes for welding various grades of mild steels, special steels, cast-iron, and other metals. The method of manufacturing is uncommon, as the routine test of both the rods and the consequential deposits are examined by X-rays and the usual testing methods in order to maintain both quality and uniformity.

The welding rectifier marketed by this company provides a flexible arc with a large current range and ease of adjustment besides a balanced load with a high power factor on either two- or three-phase mains. Types 1301 and 1303 are specially suitable for light sheet metal work and adaptable for welding down to 22 s.w.g.

The Hermes Transreceiver

The capabilities of the small radio-telephony outfit which is marketed by IDEAL TRANSRECEIVERS, LTD., 444, Ewell Road, Surbiton, Surrey, for providing communication between moving vehicles and similar services were demonstrated recently when two-way speech was easily maintained between a fire engine and the local brigade headquarters. The extreme compactness of the set increases its versatility and portability. It is quite self-contained and of small dimensions, the weight of the complete outfit being about 15 lb., so that it can be easily carried about while actually in use, or set up camera-like on a tripod.

The set operates on extra short waves and two valves only are employed, their functions being reversed from transmission to reception by a simple throw-over switch with a central "off" position. One knob provides tuning control and another serves to adjust volume, while the energy needed for both transmission and reception is derived from a 2-V non-spillable accumulator and a 145-V dry battery carried together in a separate box. A simple rod type or wire aerial will extend the range of the set, though it will work quite well without either.

An Electric Coffee Maker

A new type of electric coffee machine, the "G. P.," is being sold by MESSRS. WILLIAM GEIPEL, LTD., 156-170, Bermondsey Street, London, S.E.1. It consists of a boiler with an electrical element fitted in the base, and a funnel which fits into the top of the boiler. When the water nears boiling point it is forced up into the funnel containing the coffee, where infusion takes place. The current is then switched off, whereupon cooling produces a vacuum which sucks the liquid through the strainer back into the boiler. By this system infusion takes place at just below boiling point.

The "G.P." coffee infuser

The boiler and funnel are made of spun copper tinned internally, while the joint is metal to metal. The standard model is of one-pint capacity and is supplied in two finishes, polished copper and chromium plate. A switch-plug connector and two yards of flex are included. A combined funnel holder and spoon tray is supplied as an extra.

Multiplier for Light Meters

The BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Tottenham, London, N.17, has produced a multiplier for use with their model "B" direct-reading light meters. The direct-reading range of the latter is from 0 to 50 ft.-candles, but the multiplier enables readings to be taken from 0 to 250 ft.-candles, so converting it into a dual-range instrument.

It comprises a metal disc which just fits into the aperture in the case above the cell and is provided with a small knob for easy withdrawal. In the disc is a series of holes so arranged as to reduce the intensity of the incident light to the desired limit. With the disc in position the readings on the meter scale should be multiplied by five. It is claimed that the accuracy is not in any way affected.

Modern Lampshade Manufacture

Visiting KNIGHTSHADES, LTD., 36, Queensway, Ponders End, Middlesex, recently, we had an opportunity of seeing modern methods of electric lampshade production.

The panels for the shades are cut by machinery, twenty-four at a time, and most of the colours are sprayed on, although

Attractive Knightshade models: Nos. 82 and 178

a certain amount of hand painting is still done. In the case of the velvet shades a special machine is used for cutting the material so as to save time and reduce waste to the minimum. An automatic wire-cutter and a spot welding machine are employed in the manufacture of frames. All the wood turning and metal work is done on the premises, and use is made of a finish known as "Lumina," which has only recently been introduced into this country from America. It consists of anodised aluminium (a dyeing process), giving artistic shades of green, blue and dark red.

The company is now producing next seasop's lines, two of which are shown in the accompanying illustration. No. 52, a four-light pendant, is an example of "Lumina" finish, while No. 178 has a stand in ebonised wood and chromium-plate fitted, with an 8 in. by 6 in. bevelled edge mirror and a removable powder bowl; the base is recessed for trinkets.

Modern Type Fires

Several new fires of original and very modern design have been produced by ELECTROWAY HEATERS, LTD., Sparrow Hill, Loughborough, in preparation for the autumn.

Of particular interest is the "Column" model (2 or 3 kW) which, although massive in appearance, is made easily portable by the use of modern materials. Various combinations of finishes are available. Another outstanding innovation is the rectangular "Screen" fire, which may be placed in front of the coal fireplace or utilised as an ordinary portable fire, as desired. This is available with loadings of 1, 2 or 3 kW. The chromium-plated vertical and horizontal bars and the feet being all of solid brass render it particularly rigid and substantial. The main backplate is of sheet steel with stove-enamelled eggshell finish.

"Column" and "Screen" fires

A new convector (2 or 3 kW) has a novel internal arrangement enabling the loading to be increased without overheating the case, while features of the 1-kW "Beam" fire are chromium-plated brass parabolic reflectors with tubular elements, a handle at the back, and trunnion mounting to enable the direction of the beam to be adjusted.

To meet the demand for fires having a more elegant appearance than those built on strictly functional lines, the 1- and 2-kW "Easel" models have been produced. They are octagonal in shape and mounted on three legs, and are obtainable with green or primrose vitreous enamel finishes.

Many new inset fires of attractive and unusual designs are also being introduced.

A Paint Spray Gun

A paint spray gun, model "R.F.," especially suitable for the new synthetic finishes and aeroplane dopes, has just been put on the market by B.E.N. PATENTS, LTD., Gorst Road, Park Royal, London, N.W.10.

The B.E.N. model "R.F." paint spray gun

A round- or fan-shaped spray can be secured by the rotation of the spreader cap, of which three sizes are available designed to operate on different quantities of air. The gun, which is particularly fast-spraying, is sturdily constructed and is easily cleaned. There is a self-aligning control valve and the hand-grip is comfortable with light trigger pressure. The nozzle and needle are of stainless steel, the one-piece body being of aluminium alloy.

A Firedamp Detector

The Mines Department has issued the Firedamp Detectors (No. 2) Order, 1935 (Stationery Office, 2d.), which relates specifically to a new model of the Ringrose automatic firedamp alarm. Earlier types of this apparatus were approved in 1928 and 1929 for use in several Continental countries, as well as in Great Britain, where it is the only electrical gas detector covered by the regulations now issued. No certificate need be held by workmen using it. It provides automatic warning and enables electrical machines to be cut off when gas is present to the prescribed amount of 1¼ per cent.

The accumulator has flat plates and free acid electrolyte in a square celluloid case. Its capacity is 15 Ah with a maximum voltage drop of from 2 to 1.85 V. Two lamp bulbs are in series; one rated at 4 V, 0.3 A has a clear bulb and the other rated at 2 V, 0.6 A has a red bulb.

Ringrose automatic firedamp alarm

Normally no light is given by the red lamp, but the white light shows that the electrical circuit is intact. Air passes through a gauge into a combustion chamber comprising a porous pot containing a palladium filament heated by 1.05 A at 2 V which burns any firedamp present, thus creating a partial vacuum in the porous pot. The vacuum deflects an adjustable metal diaphragm which short-circuits the white bulb and lights up the red bulb. The new model also incorporates a relay for giving a permanent signal should it be defective.

When used for the detection of asphyxiating gases, as in manholes of supply undertakings or sewers, a chemical absorbent of such gases is placed in the porous pot, thus creating a vacuum in the latter which causes the alarm to be given.

The apparatus for making the regulation weekly tests on the detector consists of an alcohol gauge mounted on a wooden stand provided with a 2-V accumulator and a bracket for supporting the indicator. The spring contacts of the bracket make connection between the accumulator and the contacts on the underside of the contact plate of the alarm. The nipple on the underside of the contact plate is connected by rubber tubing to the inner glass tube of a graduated alcohol gauge. The rubber tube is compressed and the reading observed at which the red bulb is brought into circuit. If the reading differs by more than ¼ in. from the standard, the diaphragm contacts are adjusted.

The alarm and testing apparatus are made by INTERNATIONAL GAS DETECTORS, LTD., Great Wilson Street, Leeds, 11.

Multiway Rotary Switch

Recently a five-position rotary switch was required for a small but important cooking development. MESSRS. SANTON, LTD., Somerton Works, Newport, Mon., set to work on the problem and have now designed a switch to which there seems to be no limit to the number of "ways" or contacts embodied. The contacts of each "way" are carried on a separate disc and all the discs are common to a central operating spindle. Thus, by varying the displacement angles of the contacts and the number of discs any number of makes and breaks can be built up within a single revolution of the spindle and its operating handle. The switches are made in reciprocating and non-reciprocating styles, and in capacities of from 10 to 60 A for up to 750 V. The design is adaptable to surface mounting, with or without its own cover, or to any other style of mounting.

The construction of a Santon six-way rotary switch

New Radio Batteries

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, informs us that it has produced a new "Black Label" range of h.t. and grid bias batteries, which, it is claimed, gives a longer life than any of its type previously produced by the company. Absence of noise in operation and uniform discharge are two of its features. The range consists of 60-V to 150-V h.t. batteries, and 9 and 16½-V grid bias batteries.

A Direct-reading Saw Set

To compete with the numerous foreign makes of saw sets imported into this country MESSRS. JAMES NEILL & CO. (SHEFFIELD), LTD., Napier Street, Sheffield, 11, have introduced an "Eclipse" direct-reading saw set graduated from 4 to 12 points. Finger-tip adjustment is provided, and the saw teeth are visible during setting.

The Organisation of Industry

F.B.I. Committee's Report

THE Committee appointed by the Federation of British Industries to report upon the principles underlying the various schemes for industrial reorganisation which have been put forward has now presented its conclusions. The Committee decided that the two main questions which it had to consider were whether the existing organisation of industry was satisfactory for meeting present-day problems, and whether, if further co-operation was necessary, this should be obtained voluntarily or by compulsory means.

Consideration was first given to the functions of industry and the aims which should be kept in view. First, it was thought, industry should aim at relating the means of production to the potential demand and endeavour to maintain it at a steady level. Fair conditions of competition should be maintained and efforts should be made to ensure that an industry acted together as one unit for research, propaganda and co-operative buying and selling, and for co-operation with other industries. Industries in this country should also be enabled to negotiate on equal terms with foreign industries.

The Committee says that no considerations of political tactics or of political expediency should influence industry to modify sound views based on strictly economic considerations. It is shown that although it might have appeared that some sections of British industry were not organised so as to overcome the strain of repeated war-time and post-war crises, in comparison with the industries of other countries the position of British industry as a whole has been relatively favourable.

The past twenty years has seen vast changes in methods of production and industrialists have found it impossible to draw upon past experience for guidance.

National Policy

Even when industrial organisation has been such as to enable the carefully co-ordinated views of industrialists upon questions of national industrial policy to be presented to successive Governments, political expediency has led to the setting aside of these views. Accordingly industry has had to work out its own salvation under conditions in which the trend of national policy has cut right across the teachings of accumulated industrial experience.

In addition, the increase in obstacles to export trade and the growth of economic nationalism have created problems which no form of organisation could have completely solved.

Industry is not merely a matter of systems. The system must be sound but success depends above all on the quality of the direction. Too much importance may be attached to machinery and too little to leadership.

On the employment side British organisation is much more complete than in any other country and British industrial organisation for constructive purposes is of no mean order, although of a loose-knit character.

What Co-operation Could achieve

In 1918 the F.B.I. Commercial Efficiency Committee suggested the following subjects as a field for co-operation in the commercial and economic sphere:—The avoidance of undue competition; the regulation of prices—on a basis of efficiency not of exploitation of the consumer; the general improvement and development of an industry by the interchange of statistics and information, centralisation of research, technical and commercial education, joint propaganda, centralisation and control of sales, &c.; and the control of sources of supply of the necessary raw materials.

While few existing associations cover this whole range much progress has been made in each of the subjects stated and there has been a marked movement towards voluntary co-operation, without undue encroachment upon individual enterprise except in those industries in which the Government has taken action.

But a fuller and more complete organisation is required for the solution of the acute present-day industrial problems.

In some directions the productive capacity is far in excess of the immediate or prospective demand, particularly in the exporting industries. The existence of this surplus plant is a menace to the stability of the industries concerned, depriving them of the incentive and opportunity of reducing costs by concentrating production in efficient and up-to-date plants. Allied to this question is that of the regulation of new entrants to an industry.

In some trades certain firms fail to bear their due share of development expenditure and thus reap an unfair advantage from other people's propaganda and research.

Lack of unity has handicapped some British industries in negotiations with foreign competitors and prevented the attainment of stability in world trade conditions. In many industries there are companies which never can hope to become profitable but are artificially maintained in existence far beyond the stage at which they should have been closed down.

Reference is made to the efforts in co-operative action to deal with these problems which have been made in the shipbuilding, woolcombing and steel industries, and it is noted that in other industries, notably the cotton textile, voluntary co-operation has so far failed to find a solution.

Finance and Industry

Some of the problems mentioned can be solved by internal organisation, but the solution of the most pressing is dependent upon co-operation between industry and finance. It has long been felt by industrialists that financial institutions have taken decisions vitally affecting industry without consultation, but if the industry were fully organised it would be in a position to command such consultation.

Finance is available to buy up excessive plant and for the reorganisation of some of our older established trades, but it will not be forthcoming unless the financial authorities are satisfied that the trades concerned are so organised as to ensure the successful execution of re-organisation schemes.

Voluntary or Compulsory Co-operation?

Although it is maintained that if the majority of an industrial association were endowed with compulsory powers progress would be more rapid, the Committee doubts this as a coerced minority can create many difficulties to prevent the smooth operation of a scheme. It is considered that on the whole voluntary co-operation produces quicker results than any form of compulsion, and the Committee is definitely opposed to legislation to compel organisation which would lead to a degree of outside interference seriously hampering efficiency. Other arguments against compulsion are the rigidity which it would impose on an industry; the possibility of the majority being wrong in its ideas; and the success already achieved by associations on a voluntary basis. Foreign conditions present no reliable analogy to justify following other countries' methods.

There are cases, however, in which the voluntary system has not been successful and the Committee agrees that in such cases Parliament might properly be asked to sanction measures which would result in the enforcement of a majority scheme upon a small dissenting minority.

It is proposed, therefore, that the President of the Board of Trade, upon being assured that 75 per cent. of an industry is in favour of a scheme for regulating output, should appoint an impartial tribunal to examine the scheme. If this tribunal considered that modifications were desirable it would refer the scheme back to the industry for consideration. and when it was finally approved the President of the Board of Trade would introduce a Bill to impose it upon the whole industry The method of proceeding by means of Orders in Council is not favoured by the majority of the Committee, but Lord Melchett considers it a safeguard against party controversy in Parliament in industrial matters.

The Committee thinks that the very existence of these powers would assist in arriving at agreements voluntarily. It is also suggested that a panel of business men from which an independent unofficial advisory body could be selected might be set up by the Federation. This body would consider schemes before their submission to the Board of Trade and decide whether there was a prima facie case for action and what would be the effect of the schemes upon other industries.

The members of the Committee were Sir James Lithgow, Bt. (Chairman), Lord Melchett and Messrs. P. Bennett, W. H. Catterall, C. W. Reeve, and H. B. Shackleton. The Grand Council of the Federation has unanimously approved the adoption of the report.

Our Commercial Policy

A separate publication issued by the Federation contains a survey of Britain's recent commercial policy. While its main conclusion is that we have secured a remarkable degree of economic recovery, pointing to the wisdom of continuing the Government policy of the last few years, the improvement does not warrant feelings of complacency, because too little of the revival of industrial activity has been due to real development of the export trade.

The survey indicates the need for stimulating the growth of international trade as a whole and asks how this is to be brought about. It does not regard trade barriers and unstable exchanges as the basic cause of world depression, but as a symptom and result of unsound economic policy. It suggests that industrial protection has been a success, since it has

been designed to give protection to industries which are economic and efficient. The Ottawa Agreements have increased inter-imperial trade but the overseas Dominions have benefited more than the United Kingdom. In the interests of Empire economic development, however, a closer relation is necessary between the treatment meted out to and received by each part of the Empire from the other constituent units.

It is further found that the "Trade Agreement" countries have been the most satisfactory of our foreign customers. In all new agreements or revisions of existing ones the Federation advocates that one fact above all should be borne in mind, namely, the outstanding importance of the British market to overseas sellers. It urges most strongly that, in view of the importance of the British market, most-favoured-nation treatment should not be given more or less automatically in any treaties with foreign countries, but should be regarded as a most valuable concession by this country requiring an adequate and substantial *quid pro quo*. The document contains many statistical tables regarding imports and exports over a number of years.

In the Courts

IN the Chancery Division on Monday last Mr. Justice Eve had before him a petition by the Chiswick Electricity Supply Corporation, Ltd., for the confirmation by the Court of a reduction of its capital from £250,000 to £25,000.

Counsel explained that the company was a very successful one. Since 1893 it had carried on business at Chiswick and Aberystwyth. The Corporation took over the Chiswick undertaking in 1893 from the Local Board with an option of repurchase. Notice had been given to repurchase and also notice to purchase the Aberystwyth undertaking. The company had received £283,000 and it was now returning £225,000 to its shareholders and ultimately it would be wound up.

His Lordship sanctioned the reduction.

An Uncertified Meter: Council Loses Appeal

In the Court of Appeal before Lords Justices Slesser and Roche and Mr. Justice Swift, on July 26th, an appeal was heard by the East Ham Corporation from the judgment of Judge Thompson, K.C., at the Bow County Court in favour of the plaintiff in the action, Mr. H. Joseph, an estate agent, who claimed an injunction and damages against the East Ham Corporation for improperly cutting off his electricity supply.

The action arose from a disputed account. The Corporation claimed that during the June, 1934, quarter Mr. Joseph had used 2,021 kWh, which was considerably higher than the consumption in the corresponding quarter of the previous year. Mr. Joseph maintained that the meter was out of order and suggested that there had been a mistake of 1,000 kWh. He sent a cheque for £2 7s. 6d., this amount being based upon the consumption for the corresponding quarter of the previous year. The cheque was returned and on August 1st the Council wrote to Mr. Joseph saying that the meter had been tested and found to be registering correctly and also offering to have the meter tested by the L.C.C. on receipt of 10s. 6d.

Then Mr. Joseph saw the borough engineer and offered to pay the whole sum demanded pending proof of the sum being due. On June 18th the Council wrote stating that it was willing to reduce the excess consumption by 50 per cent. and the amended account would be £4 15s. 4d. On October 3rd Mr. Joseph tendered £2 10s. 4d. by cheque, which was accepted on account and the balance was demanded by the Council. Mr. Joseph not complying, the electricity supply was cut off. Then Mr. Joseph applied *ex parte* to the Chancery Division asking for an injunction to restrain the Council from cutting off his supply. The Council then gave an undertaking to reinstate the supply and its solicitors agreed to hold the £2 10s. 4d. which Mr. Joseph paid in the capacity of stakeholders pending the hearing of the action in the County Court.

In the County Court the defence filed was that the defendant Council was governed by a written contract. The Council denied that the meter had been misread and it did not admit that a *bona fide* dispute had arisen and further that in the circumstances it was entitled to disconnect the supply. It was further claimed that the meter was tested on June 26th and proved to be within the permitted limits of error. The Council as a defence relied on Section 57 of the Electric Lighting (Clauses) Act, 1889, and the Electric Lighting Act, 1882, Sections 12 and 21. It also counterclaimed for £3, the cost of disconnecting and reconnecting the supply.

Mr. Joseph's contention was that the Council had no right to assume that its meter was correct and to disconnect his light, there being a *bona fide* dispute.

Judge Thompson held that Mr. Joseph was entitled to the relief which he claimed, and gave judgment in his favour for all the costs of the action in the High Court and in the County Court on Scale "B" and he gave Mr. Joseph leave to apply for an injunction if necessary. From this judgment the Corporation now appealed.

Mr. Croom-Johnson, for the appellants, said that the case raised an important question as it affected the whole of the electricity consumers in the borough because the respondent Mr. Joseph was disputing the authority of the Borough Council to rely on the record of its meters. He admitted that there was a dispute but not a *bona fide* dispute within the meaning of the statute. Mr. Joseph had received notice that unless he paid the balance of the account by a certain date in November the supply would be disconnected and that was done.

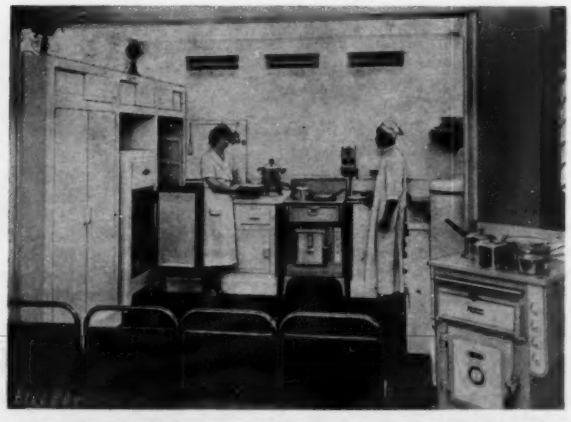
Lord Justice Roche said he could not see why the defendant authority could not have sued the plaintiff in the County Court without cutting off his supply.

Mr. Croom-Johnson said that the difficulty was that no electric inspector had been appointed.

The hearing was concluded on Monday last when the appeal was dismissed. In the course of his judgment Lord Justice Slesser said that under Clause 50 of the Schedule to the Electric Lighting (Clauses) Act, 1899, an electricity meter had to be of a construction and pattern approved by the Board of Trade and certified by an electric inspector appointed under the undertaking's Special Order. The County Court judge had found that the East Ham Corporation had never appointed an electric inspector within the meaning of the Electricity Acts and therefore none of its meters had been properly certified.

The Court had been told that except in one or two instances no electric inspectors had been appointed by electricity authorities in this country. If that were so, the consequences might be extremely serious.

The Corporation had maintained that it had the right to cut off the supply in the event of non-payment of an account under Section 21 of the Electric Lighting Act, 1882, but if there were no certified meter it was impossible for the authority to say that there was a sum due within the meaning of the Section. Lord Justice Roche and Mr. Justice Swift concurred in the dismissal of the appeal and leave to appeal to the House of Lords was refused.



Even in Darkest Africa electric cooking is becoming popular. Our picture shows a demonstration arranged at Nairobi by the East African Power & Lighting Co., "Magnet" cookers being employed

E. K. Cole, Ltd.: Scheme of Arrangement

In the Chancery Division on July 29th Mr. Justice Eve had before him a scheme of arrangement between E. K. Cole, Ltd., manufacturers of wireless apparatus and their shareholders.

Mr. H. Christie, K.C., for the company said that its present capital was £500,000 divided into 200,000 cumulative preference shares of £1 and 1,200,000 preferred ordinary shares of 5s. By the scheme it was desired to issue first preference shares having priority over the other two classes and some doubt had existed whether the company had power to do so. The company was very prosperous, having made a profit of £250,000 last year. It was proposed to take 100,000 of the unissued preferred ordinary shares and convert them into cumulative first preference 5½ per cent. shares and to create a further 150,000 of the same class, thus putting £250,000 in front of the existing shares. At meetings of both classes of the shareholders the scheme had been approved.

His Lordship sanctioned the scheme.

The Cost of Removing Telegraph Lines

The Court of Appeal, consisting of Lord Justice Slesser, Lord Justice Roche and Mr. Justice Swift, on July 26th dismissed an appeal by the Postmaster-General against a judgment given by Mr. Justice Goddard in favour of Birmingham Corporation against whom an action regarding the cost of removing telegraph lines was brought.

The Corporation set up in its defence Section 15 of the Telegraph Act, 1863, which stipulates that the cost of removal of telegraph lines at the request of the road authority of a district shall be defrayed by "the company" (*i.e.*, the owners of the telegraph lines). For the Postmaster-General the Telegraph Act of 1878 was cited as laying the onus upon the other party.

The Court of Appeal agreed with Mr. Justice Goddard that the matter fell within Section 15 of the 1863 Act and dismissed the appeal.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Rental Wiring at St. Pancras

The Electricity and Public Lighting Committee of the St. Pancras Borough Council has considered the arrangement with the local branch of the Electrical Contractors' Association for canvassing consumers under the Council's rental wiring system, which has been in force for an experimental period, and has recommended that this arrangement shall not be renewed, and that only in the event of extreme pressure on the Department shall wiring work be passed to a contractor. It is also recommended that the chief electrical engineer and manager be empowered to engage the requisite extra staff to enable the work to be carried out in future by the Department, and that wiring work introduced by a contractor shall be carried out by that contractor.

Municipal Trading at Croydon

The Croydon Corporation Electricity Committee has again considered the question of the schemes for the installation of electricity in private dwellings and the hire purchase and sale of apparatus and fittings by the Corporation, and now recommends that the present arrangements for stocking the showroom by electrical contractors be discontinued, and that the Electricity Committee should sell fittings, apparatus and appliances direct to the public at not less than the recognised retail prices and install fittings, &c., supplied or hired direct by the Corporation to consumers. It is proposed that installations provided under the rental wiring scheme and the hire-purchase quarterly payments scheme shall be carried out by contractors and that wiring incidental to apparatus hired or purchased through the introduction of a contractor shall be carried out by that contractor.

The "Astoria," Southend

In the recently opened "Astoria," Southend now possesses one of the largest cinemas in the country. One of the outstanding features of this new building is the modern architectural illumination, which has for its keynote simplicity in design and decoration. An impressive vastness has been achieved in the auditorium by means of a tiered roof to which rise the lofty columned walls, and the effect has been cleverly accentuated by the use of concealed lighting running the whole length of the columns and feet of the tiers. Altogether, 2,000 ft. of special cornice strip has been used for this purpose. The vestibule is both spacious and attractive and for its illumination "Royal Ediswan" architectural lamps have been chosen. These lamps have been arranged in columns of three on the walls and are also inset into a modern "well" from the tea room above. The treatment in this part of the building shows very clearly that architectural lamps not only give adequate illumination, but have a high decorative value. "Harcourt" decorative fittings, designed to harmonise with the scheme of architecture, have been installed in the foyer and restaurant. Some idea of the size of the theatre can be derived from the facts that approximately 54,000 yds. of Edison Swan cable have been used for the electrical installation and over 4,000 "Royal Ediswan" lamps are employed, in addition to the architectural lamps and cornice strip. The lighting equipment was supplied by the Edison Swan Electric Co., Ltd., and the installation was carried out by Messrs. Drake & Gorham, Ltd. The consulting engineers were Messrs. Charles H. Bell & Co., Ltd., and the architect was Mr. E. A. Stone. Views of the theatre appear on page 149.

New Electricity Showrooms at Malton

The new showrooms of the North-Eastern Electric Supply Co., Ltd., which were recently opened at Malton, Yorks, by Councillor F. Nendick, chairman of the Urban District Council, were previously used as a china and general dealer's stores, and have been redesigned in order that electrical fittings and apparatus may be displayed in a modern setting. An electric demonstration kitchen, capable of seating forty persons, has been incorporated. The lower ground floor is used as stores and garage, and the first floor has been converted into offices for the administration staff. The architects were Messrs. L. J. Couves and Partners. The accompanying illustration is reproduced from a photograph taken at the opening ceremony.

The new Malton showrooms of the N.E.S. Co.

Bookstall Lighting

An interesting application of architectural lamps is that adopted for the illumination of the bookstall of Messrs. W. H. Smith & Son, Ltd., in the Mount Royal flats, Marble Arch, W. The bookstall is situated in the vestibule and has to be artificially lighted all day, so that it is important that the lighting should be soft yet effective. Siemens opal architectural lamps are used, and, as our illustration shows, the light is effectively distributed on all the papers and books displayed. The installation was carried out by Messrs. W. T. Clarke & Co., Ltd.

A bookstall lighted by architectural lamps

Irish Free State Electrical Imports

Although not quite so active as in April the trade in electrical machinery and cognate material in the Irish Free State during May showed a marked improvement over the corresponding month a year ago, the value of the imports attaining a total of £44,914, as against £28,222. The appended table shows the I.F.S. electrical imports during the first five months of the current and past years, from which it will be seen that there has been an advance of £72,942:—

	First Five Months.	
	1934.	1935.
	£	£
Electric motors	15,852	22,007
Other electrical machinery	79,396	90,713
Dry batteries and parts	8,426	10,142
Electric lamp bulbs	17,222	32,000
Electric lighting accessories, fittings and parts ...	17,051	32,455
Telegraph and telephone apparatus	4,447	2,605
Radio receivers, complete	19,574	22,306
Radio-gramophones, complete	1,554	1,556
Other radio apparatus, fully or partly assembled ...	3,404	2,098
Radio parts and accessories	26,123	25,940
Other electrical goods and apparatus	66,170	90,339
Totals	£259,219	£332,161

Electrical Imports of the Philippines

According to a D.O.T. report on economic conditions in the Philippines, imports of electrical machinery and apparatus during 1934 amounted to £434,000 in value, an increase of £95,000 as compared with the preceding year. The United States holds a preponderant position in the market.

Electrical Distribution in France

Interesting developments are expected as a result of the French Government's decree concerning the electrical distribution and production industries. This decree provides in the main for a more elastic system of rates by the introduction of further classifications and for a reduction of existing rates by a general decrease in prices by both producers and distributors, maximum and minimum prices being stipulated to

mitigate any injustices which may be caused by the severe cuts called for. Existing contracts will be revised not only as regards rates but also as regards the general conditions of operation of the companies. Provisions are made which are intended to encourage the combining of existing small networks, and these combinations are exempted from the taxes usually due in these cases. If any of the companies feels that the provisions will result in financial difficulties, it may either ask to be bought out, or to be allotted a subvention from a special fund resulting from the application of a 4 per cent. tax on all electricity sold for lighting purposes. The remainder of this fund is to be used by the Minister of Public Works to grant subsidies for improvements which he may consider necessary or desirable in the present networks. The decree further provides for the creation of a "Superior Council of Electricity," representing consumers and producers, which is to form a permanent advisory body to the Minister of Public Works on electrical questions.

The Wolverhampton Floral Fête

At the recent Wolverhampton Floral Fête the Corporation Electricity Department took part, its exhibit including a comprehensive display of domestic appliances and apparatus for

A part of Wolverhampton Electricity Department's exhibit at the local Floral Fête

horticultural use. The stand was divided into a number of cubicles, and our picture shows the section displaying electric cookers, water heaters and other apparatus.

Electric Baking in the Navy

The first, second and third prizes in the bread baking competition which was recently held in the Home Fleet among ships equipped with bakeries, were awarded to H.M.S. *Achilles*, H.M.S. *Orion*, and H.M.S. *Leader* respectively. All these ships, which belong to the second cruiser squadron, are fitted with "Magnet" Admiralty pattern 5 ft. by 4 ft. double-deck baking ovens. Ovens of this type, which differ only in small details from the standard "Magnet" peel type ovens, are now operating in many ships of the Home Fleet, while others have been supplied by the General Electric Co., Ltd., to the Royal Australian Navy.

A Mobile Showroom

The Reyrolle show van is at present touring the country equipped with electrical water-heating and steam-raising equipment. The principal feature is an electrode water-heater of the type that is being generally adopted for building and bath warming. The equipment is complete with standard main and auxiliary control switchgear and is arranged to provide a practical working demonstration covering all the functions of the plant under normal and emergency conditions. The electric power for operating the controls is obtained from a small motor-generator set. A 10/35-kW 400-V electrode steam-raiser is also installed in the show van. Examples of immersion-type heaters for building-warming and industrial purposes complete the display. An expert is in attendance to demonstrate the equipment. The accompanying illustrations depict the exterior of the show van prior to its departure for Scotland, and the interior showing a low-voltage electrode water heater.

British Executives

When opening the library and clubroom of the Institute of British Executives on July 23rd, the Duke of Kent said that there was an enormous waste of experienced personnel existing in this country, and if this problem was to be overcome, the scope of the Institute must be widened so as to embrace all executive men, whether employed or unemployed. It might thus become a representative organisation to deal with all problems affecting executive men as a whole. His Royal Highness added that the Institute was particularly interested in the subject of representation of British firms overseas. It had on its register engineers and business men of all kinds whose experience had been gained in every country in the world, who knew the languages of those countries and the mentality of the people.

New Sloan Premises

As from August 6th next the head offices, central stores and main showrooms of the Sloan Electrical Co., Ltd., will be removed to "Slonetric House," 54/55, Fetter Lane, E.C.4. (Telephone: Central 5200. Telegrams: Slonetric Fleet, London.) A special feature of the new premises will be extensive showrooms on the first floor in which will be displayed modern fittings, domestic appliances and radio apparatus. The trade counters at 12, Golden Lane, E.C.1, 41, Kingsway, W.C.2, and at 58, Uxbridge Road, W.5, will be retained.

An Electrical Tableau at Willesden

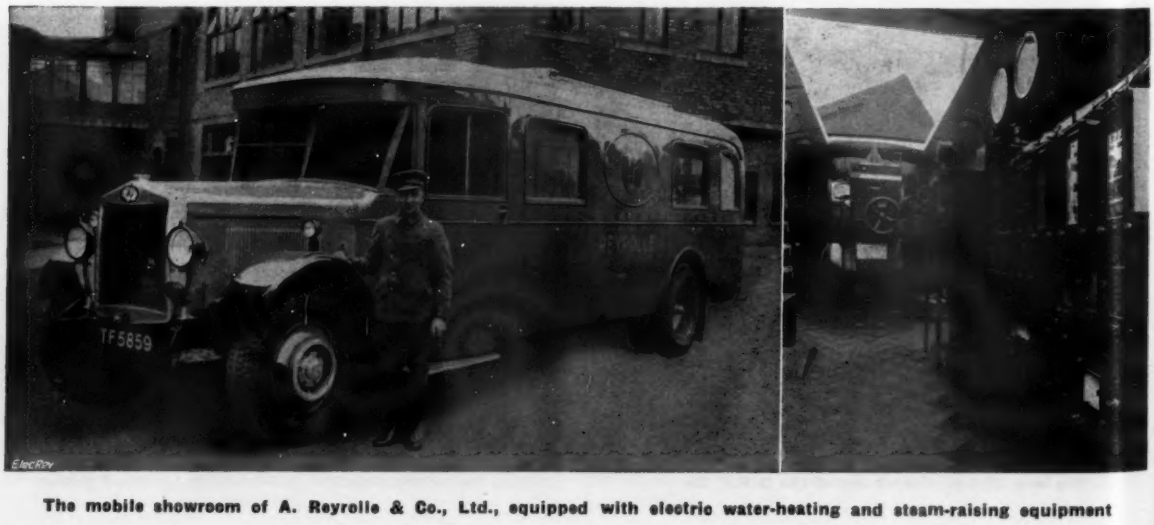
The accompanying illustration is reproduced from a photograph sent us by Mr. J. D. Spark, electrical engineer and

Willesden Electricity Department's decorated car

manager to the Willesden Borough Council, and shows a decorated car which the Electricity Department entered for the local hospital carnival and which was awarded a prize.

Colour-lighting Data

A useful treatise on colour lighting for stages, ballrooms, shop windows, restaurants, &c., has been produced by Holo-



The mobile showroom of A. Reyrolle & Co., Ltd., equipped with electric water-heating and steam-raising equipment

phane, Ltd., Elverton Street, London, S.W.1. In this the company's lighting engineers explain the layout and equipment for the production of some remarkable results. Some actual installations are described and many of the illustrations are in colour.

Health Exhibition Awards

The following exhibitors have been awarded silver medals for their exhibits at the recent Health Exhibition, held at Bournemouth under the auspices of the Royal Sanitary Institute:—The British Electrical Development Association; the British Vacuum Cleaner & Engineering Co., Ltd.; Hoover, Ltd.; and Ismay Zeros, Ltd.

Trade Announcements

Messrs. J. Charlton & Co., Ltd., have removed to 65, Livery Street, Birmingham.

The address of the London office of the Metropolitan-Vickers Electrical Co., Ltd., and the Export Company, will be 1, Kingsway, W.C.2, on and from August 6th next. The telegraphic address will be "Multiphase Estrand, London," but the telephone number will remain unchanged.

The Kniveton Cable Works, Ltd., has acquired the plant and machinery, fixtures and fittings of Hart Bros. Electrical Manufacturing Co., Ltd., from the receiver of that business, and intends to continue the manufacture of all classes of cables and wires, &c., hitherto produced by the plant purchased. The staff of Hart Bros. has been retained.

Messrs. Adamson & Co. (Tyne), Ltd., have been appointed to act as the Northern depôt for Messrs. Crompton Parkinson, Ltd., for Crompton & "Kye" lamps, and Derby v.i.r. cable, and are opening a branch at 30, Handysides Arcade, Percy Street, Newcastle-on-Tyne, under the management of Mr. W. Laws.

Electricity Supply Rifle League

As a result of matches shot during June, the leaders of the various divisions in the Electricity Supply Rifle League are as follows:—First division: L.P. Co. "A." Division 2: City "C." Division 3: K. & K. Division 4: Lewisham "A."

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances.

CHEMICALS, ETC.	Price, July 31st.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£15 10s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate... ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur Commercial... ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3¼d. to 3⅜d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil... ... ... ,,	1/2 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£213	£2 inc.
Grade II ... ... ,,	£147	£2 inc.
Grade III... ... ... ,,	£75	—
c Brass (rolled metal 2" to 12" basis) per lb.	7d.	—
c ,, Tubes (solid drawn) ... ... ,,	9¼d. to 9¼d.	—
c ,, Wire, basis ... ... ,,	7¾d.	—
c Copper Tubes (solid drawn) ... ,,	10d.	—
f ,, Bars (best selected)... ... per ton	£62	£2 inc.
f ,, Sheet... ... ... ,,		
f ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£35	—
d ,, ,, Wire Rods ... ,,	£41	—
d ,, ,, H.C. Wire ... per lb.	6¼d.	—
f Ebonite Rod ... ... ,,	1/6 to 2/– plus	—
f ,, Sheet ... ... ,,	1/3 to 1/6 10%	—
n German Silver Wire ... ... ,,	2/5	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	4¼d.	¼d. dec.
i Iron, Pig. (Cleveland No. 3) ... per ton	62/6	—
i ,, Wire galv. No. 1, P.O. Qual.... ,,	£20	—
g Lead, English Pig ... ... ,,	£17 5s.	£1 5s. inc.
g Mercury ... ... per bot.	£11/7/6 to £11/17/6	—
e Mica (in original cases) small ... per lb.	6d. to 1/–	—
e ,, ,, medium ... ,,	5/– to 10/–	—
e ,, ,, large ... ,,	10/6 to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	11¼d.	—
p ,, ,, rolled strip & sheet ,,	10¾d.	—
p ,, ,, wire ... ... ,,	11¼d.	¼d. inc.
o Platinum ... ... per oz.	£7	—
d Silicium Bronze Wire ... ... per lb.	7¾d.	—
r Steel, Magnet, in bars ... ... ,,	7¾d.	—
g Tin, Block (English)... ... ... per ton	£233	15s. inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	—

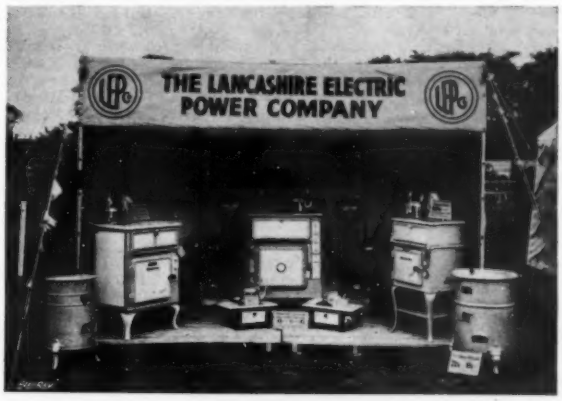
Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha, and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead and rubber, up to the time of going to press, are given in our "Business Notes" under the same heading.

The Worsley Agricultural Show

The Lancashire Electric Power Co.'s exhibit at the Worsley one-day Agricultural Show held on July 27th was awarded a silver medal. An elaborate stand was not possible, as the whole display had to be got together in a few hours, but the



The L.E.P. Co.'s stand at the Worsley Agricultural Show

exhibit, consisting of a pale green and yellow tent, suitably lettered, and with brightly coloured display cards to liven up the display, showed off a range of electric cookers, water heaters, irons, fires, kettles, &c., to advantage.

Annual Holidays

The Saxonia Electric Wire Co., Ltd., is closing down during August Bank Holiday week, and will re-open on August 12th. A small staff will be in attendance to deal with urgent matters.

Brittain's Electric Motor Co., Lewisham, is also closing down during next week.

The works and offices of Brook Motors, Ltd., will be closed from August 9th to 19th. A small staff will attend to urgent inquiries.

New Catalogues and Lists

Hartley Turner Radio, Ltd., Thornbury Road, Isleworth, Middlesex.—A folder containing particulars of the company's radio programme for 1935-36.

Gent & Co., Ltd., Faraday Works, Leicester.—A well-produced catalogue illustrating and giving brief particulars of the "Pulsyn-etic" system of electric clocks and time discipline apparatus.

Thomas Bolton & Sons, Ltd., P.O. Box No. 3, Widnes, Lancs.—A booklet entitled "Cadmium Copper Contact Wire," with particular reference to the company's products.

Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, N.17.—A leaflet drawing attention to Benjamin "Glassteel" diffusers and "Benflux" reflectors for school lighting.

Electric Construction Co., Ltd., Shell-Mex House, Strand, W.C.2.—Booklet B.1140, relating to mercury-arc rectifiers and containing illustrations of the company's works.

Lancashire Dynamo & Crypto, Ltd., 94, Petty France, Westminster, S.W.1.—A new catalogue describing geared motor units with prices and outputs. Some excellent illustrations of typical installations are included. Also a July stock list of electric motors.

Stuart Turner, Ltd., Henley-on-Thames.—A list of generating sets dealing with both marine and stationary d.c. sets from 250-W to 3 kW, and a.c. sets of the same outputs.

Saxonia Electrical Wire Co., Ltd., Roan Works, Greenwich, S.E.10.—A net trade price list of enamelled, silk and cotton insulated magnet wires.

Switchgear & Cowans, Ltd., Delavox Works, Banbury.—A pamphlet containing an illustrated description of the "S.E." oil-immersed self reclosing circuit-breaker.

Ferranti, Ltd., Moston, Manchester, 10.—A catalogue containing illustrations in colour of radio receivers and radiograms, with prices and brief particulars. Some illustrations of the company's radio factory are also included.

Bankruptcy Proceedings

S. S. West and **L. A. Brown** (trading as Webro Electrical Contractors), 41, Goodge Street, W.—This firm failed in July, 1934, and on July 23rd the debtor West applied to Mr. Registrar Mellor at the London Bankruptcy Court for an order of discharge. Mr. Bruce Park, Official Receiver, reported that the provable debts amounted to £1,965 and the assets had realised £65. The debtor Brown had not surrendered to the proceedings, and his public examination had been adjourned *sine die*. The failure was attributed to lack of capital, heavy expenses, and bad debts. The discharge was suspended for twelve months.

F. E. V. Hooper, 26, Moorgate Avenue, Crookesmoor, also trading as "Hooper's Service Station," Walkley, Sheffield, electrical engineer.—The public examination was held on July 25th at Sheffield. The statement of affairs disclosed liabilities of £258 and assets of £113. Debtor attributed his failure to losses on contracts, losses on motor car dealings, and depreciation of assets. The examination was closed.

W. Hodge, 3, Saltash Street, Plymouth, electrical engineer.—The first meeting of creditors was held at Devonport recently. Debtor's statement of affairs showed ranking liabilities of £1,607 and a deficiency of £394. The creditors passed a reso-

lution for the appointment of Mr. W. A. J. Osborne, of Messrs. Corfield & Cripwell, Balfour House, Finsbury Pavement, London, E.C., as trustee of the estate. A committee was also nominated consisting of Mr. J. Sanger and the representatives of the General Electric Co., Ltd., and British Insulated Cables, Ltd.

W. J. Richardson, the Imperial Radio Stores, 6, Glebeland Street, Merthyr Tydfil, wireless dealer.—The public examination was held at the Town Hall, Merthyr Tydfil, on July 24th, and was closed. Debtor, whose gross liabilities were £648 with a deficiency of £595, said that he commenced the business with money borrowed from his wife. He attributed his failure to trade depression and competition in the radio relay business.

M. Morrie, 3, Thornhill Road, Plymouth, Devon, wireless dealer.—At the first meeting of creditors held recently at Devonport it was disclosed that there was a deficit of £1,395. The case being a summary one was left in the hands of the Official Receiver as trustee.

J. Cave and **T. W. Bowler** (Taylor & Wynne), electrical engineers, trading at back 180, Green Lanes, Small Heath, Birmingham.—Last day for receiving proofs for dividend August 8th. Trustee, Mr. C. Hoult, 159, Great Charles Street, Birmingham, Official Receiver.

F. V. Lambert, electrical contractor, 31, Harmer Street, Gravesend.—Receiving order made July 22nd on debtor's own petition. First meeting August 7th at Bankruptcy Buildings, Carey Street, W.C. Public examination August 26th at the Court House, Rochester.

J. H. Wood, electrical and wireless engineer, 61, Holborn Hill, Millom.—Receiving order made July 23rd on debtor's own petition.

E. H. Goldie, radio engineer, Dunkerque, The Parade, Dudley.—Last day for receiving proofs for dividend August 14th. Trustee, Mr. A. M. Fairbairn, 1, Priory Street, Dudley, Official Receiver.

W. C. Stephenson, wireless dealer, 1, Barnfield Road, Spennymoor.—First and final dividend of 8s. 5d. in the £, payable July 30th at 32, Frederick Street, Sunderland.

W. Hodge, electrical engineer, 3, Saltash Street, Plymouth.—Trustee, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C., appointed July 26th.

W. A. Hammond, wireless dealer, Middle Street South, Great Driffield.—Receiving order made July 22nd on debtor's own petition.

Company Liquidations

Anti-Vibration Electric Lamp Co., Ltd., 40, King William Street, E.C.—The first meetings of the creditors and shareholders under the compulsory liquidation of this company were held on July 24th at Carey Street, W.C. The statement of affairs showed unsecured liabilities £1,958, preferential claims £29, debenture loans £2,050, assets £996, an issued capital of £2, and a total deficiency of £3,043. Mr. H. P. Naunton, Assistant Official Receiver, reported that the company was promoted by C. V. Radeglia and W. Lennard, in April, 1922, to carry on business as manufacturers, exporters, importers and dealers in electrical goods and accessories of every description. The principal object, however, was to acquire an agency agreement for the sale of electric lamps from N. V. Vereenigde Industrieen, Rotterdam, and practically the whole of the company's business was confined to the sale of the lamps supplied under that agency, which terminated on July 30th, 1933. Debentures for £2,000 were issued in 1923 to secure a cash loan of the same amount, and on June 30th, 1933, Mr. J. H. G. Peterkin was appointed receiver for the bondholders. The petition on which the winding-up order was made on June 24th, 1935, was presented by the N.V. Co. The failure of the company was attributed by Mr. Radeglia (1) to the unwillingness of the company to continue the N.V. agency; (2) to the injunction restraining the sale of the N.V. lamps; and (3) to the costs and charges incurred in the actions brought against the company by the N.V. Co. The liquidation was left in the hands of the Official Receiver.

Durrants Engineers, Ltd., 4, Suffolk Road, Lowestoft, electrical engineers.—The statutory meeting of creditors was held recently at Lowestoft, when a statement of affairs was submitted showing liabilities of £3,617, of which £2,130 was due to the trade and cash creditors for £1,017. The net assets totalled £1,151, leaving a deficiency, subject to the costs of liquidation, of £2,467. The company was incorporated in 1920 with a nominal capital of £5,000 and took over a business carried on by Messrs. A. G. and W. E. Durrant, the purchase price being £2,688. The first year's trading showed a profit, but in the next two years heavy losses were sustained. In 1922 there was a debit balance on the profit and loss account of £2,046. From 1924 to 1933 profits were made, and that debit balance was reduced to £660. In October, 1933, the company, which had occupied premises at Suffolk Street, removed to 101, London Road, but in March, 1935, it sub-let those premises and returned to its original address. Those removals, losses on trading and heavy competition were stated to be the reasons for the present position. It was explained that the company had met and passed resolutions for voluntary liquidation, and had nominated Messrs. W. P. Gill and Mr. A. G. White as liquidators. The creditors resolved that the voluntary liquidation of the company should be continued with Mr. F. E. Bendall, of Messrs. Poppleton and Appleby, and Mr. W. P. Gill, of Turnbridge Lacey and Co., as joint liquidators, with a committee of inspection consisting of the representatives of Messrs. Falk, Stadelmann and Co., Ltd., Clarke Hunt and Co., Callender's Cable and Construction Co., Ltd., and Mr. B. G. Beech.

Dissolutions of Partnership

Midland Electrical Installations, electrical engineers, 443, Meadow Lane, Nottingham.—Messrs. S. Hinchliffe and H. Salmon have dissolved partnership.

Smith & Sons, electrical and domestic engineers, 7, St. John's, Worcester.—Messrs. R. H. Smith and W. H. Smith have dissolved partnership. Mr. R. H. Smith will attend to debts and carry on the business.

Electricity Supply

Lighting, Domestic, Power

Aldborough (Yorkshire).—LIGHTING PLANS.—The Parish Council has approved plans submitted by the North-Eastern Electric Supply Co., Ltd., for lighting Aldborough St. John.

Australia.—MELBOURNE.—The Electricity Supply Committee has asked for estimates of the cost of laying cables underground in about 150 streets.

Becontree.—SUB-STATION.—The L.C.C. has leased a site in Wykeham Green to the Barking Corporation for a sub-station.

Belgium.—ELECTRICAL PROGRESS IN 1934.—Official statistics show that for the first eleven months of 1934 the production of electricity by central stations of 100 kW and over amounted to 3,663,654,000 kWh, an increase of 118,022,000 kWh as compared with the corresponding period of the preceding year. Ninety-nine per cent. of the population now use electricity, and 97 per cent. of the communes have supplies. Supply authorities, in conjunction with the manufacturers and electrical contractors, are continuing their successful and energetic campaign to encourage the use of domestic appliances. Owing to the unfavourable circumstances there was a decrease in the amount of energy supplied for industrial purposes.

Birkenhead.—MAINS AND SERVICES.—Sanction is being sought by the Electricity Committee to borrow £30,000 for mains and services.

Birmingham.—ALL-ELECTRIC BATHS.—The Baths Committee has decided to use electricity for heating and filtering the new Kingstanding swimming baths.

Blackpool.—ILLUMINATIONS.—The annual illuminations will commence on September 14th and last until October 21st. There will be five miles of promenade illumination, for which 300,000 lamps will be used. In addition, there will be floodlighting, searchlights and tableaux.

Brighton.—SUPPLY TO FULKING.—The Electricity Committee is to provide a supply to Fulking at a cost of £386.

Cannock.—ECONOMIC WORKING.—An interesting fact recorded in the annual report of Mr. P. Wardle, chief electrical engineer and manager, is that there was a considerable reduction in the energy lost in transmission and distribution in 1934-35 compared with previous years, 92.7 per cent. of the electricity purchased being accounted for.

Clitheroe.—ELECTRICITY FOR CEMENT FACTORY.—The Electricity Department is carrying out considerable extensions in connection with the works which the Ribblesdale Cement Co. is erecting in the town at a cost of £120,000. About nine million kWh will be required each year.

Coventry.—MAINS AND PLANT.—The Electricity Committee is seeking sanction to a loan of £4,000 for mains and plant.

Eastbourne.—LOANS FOR EXTENSIONS.—The Electricity Committee has obtained sanction to loans of £3,340 for extensions to Dukelands Estate, Pevensey Bay, and £6,396 for a supply to Polegate Farm Estate.

Fleetwood.—ELECTRICAL PROGRESS.—The electricity undertaking sold a record quantity of electrical energy last year and made a net profit of £5,500. Sales reached 10,804,600 kWh, an increase of 22 per cent. on the previous year, while the number of consumers advanced by 331 to 5,769. Of the buildings in the town 89 per cent. are wired.

Grimsby.—SURPLUS.—There was a surplus of £7,045 on the working of the Electricity Department last year.

DISTRIBUTION.—The Electricity Committee is seeking sanction to borrow £5,350 for distribution works.

Heckmondwike.—CHANGE-OVER.—The supply is to be changed over from d.c. to a.c. and the Urban District Council has made application to the Electricity Commissioners for sanction to a loan of £45,000, or such other appropriate sum as may be necessary for the completion of the work.

Hertfordshire.—SCHOOL LIGHTING.—Steps are being taken by the County Education Committee to modernise the lighting systems at a number of schools. In the case of the St. Margaret Road school, East Barnet, and the All Saints boys' school, Hertford, electricity is being installed in place of gas, while at the West Hyde school, Rickmansworth, the electrical installation will replace oil lamps.

India.—HYDRO-ELECTRICITY IN MYSORE.—The Government of Mysore has adopted a scheme for a new generating station at Krishnaraja Sagara, capable of developing 10,000 h.p. and estimated to cost Rs.2,800,000.

Isle of Man.—ELECTRICITY BOARD'S REPORT.—The first complete year of operation (April 1st, 1934, to March 31st, 1935) covered by the Electricity Board's second report has been particularly concerned with the development of the extensive networks already established and the fuller use of the transmission lines. During the year 71¼ miles of 33-kV transmission lines were constructed and twenty-three separate distributing networks were established. The whole of the distribution extensions and service installations are now being carried out by direct labour. Substantial reductions in electricity charges have been made, a block tariff being also introduced for motive power. Exhibitions and demonstrations have resulted in an increase in the number of cookers on

hire from 16 to 89, and the total number of consumers has been practically doubled, rising from 829 to 1,541. Prepayment and rental wiring schemes have been adopted. In November the Board entered into a fifteen-year agreement with the Manx Electric Railway Co., Ltd., to provide the whole of the latter's electrical requirements. The total revenue amounted to £10,784 and the gross profit to £4,043, there being a net surplus of £248. As the population is only about 110 persons per square mile, the Board indicates that it will be unable to provide supplies to isolated farms and hamlets without their making substantial financial contributions.

Kettering.—TARIFF REDUCTIONS.—Consumers will benefit approximately £12,000 per annum as a result of concessions authorised by the Urban District Council. Power rates are to be reduced by about 25 per cent., and low-rate supplies under the domestic tariff will be charged at ½d. instead of ¾d. per kWh.

Laurencekirk.—ELECTRICITY NEGOTIATIONS WITH GRAMPIAN CO.—The Grampian Electricity Supply Co. has put a new plan before the Town Council in regard to the introduction of electricity to the burgh. The main question which gives rise to the dispute between the two parties is whether poles should be erected in High Street or underground cables laid. In the new scheme the Grampian Company has suggested steel poles instead of wooden ones, on condition that it is given a 15-year contract for the street-lighting of the burgh.

London.—LOWER CHARGES.—Continuing its policy of reducing and standardising its rates, the County of London Electric Supply Co., Ltd., announces a ½d. per kWh rate in its inner London and suburban areas and ¾d. in its rural areas for water heating—available either to flat rate or two-part tariff consumers.

POPLAR.—The Borough Council has asked Mr. J. Roger Preston, heating engineer, to consider the employment of an electrical thermal storage system in the new municipal buildings.

ST. MARYLEBONE.—In connection with the scheme for wiring blocks of tenement properties the Electricity Committee recommends the installation of rising mains costing £556 at Ossington Buildings (comprising 144 tenements), and is to provide rising mains to 140 flats and six studios at Wellesley Court, Maida Vale (£1,352); 60 flats at Stockleigh Hall, Regent's Park; 11 flats in Wimpole Street; 185 flats at Dorset House, Marylebone Road; 65 flats at 59, Weymouth Street; and nine flats at Northumberland Mansions, Northumberland Street.

Lowestoft.—METERS.—The Electricity Committee is seeking sanction to borrow £12,000 for meters.

Maldon.—OVERHEAD LINES.—The Town Council has consented to the erection of overhead lines by the County of London Electricity Supply Co., Ltd., from Lodge Road to Great Beeleigh Farm.

Manchester.—NEW PLANT FOR BARTON.—The Electricity Committee has obtained sanction for the extension of the Barton power station and is to obtain tenders for the provision of a 50,000-kW turbo-alternator and two boiler units.

LOWER CHARGES.—The Committee recommends reduced charges in respect of the assisted-wiring schemes and prepayment meters. It is suggested that the charge should be 6d. per kWh instead of 7d.

LOAN.—The sanction is being sought to a loan of £100,000 for service mains.

Middlesex.—INSTITUTION SUPPLY.—The County Council Health Committee is to arrange for the provision of an electricity supply to its new Harefield institution on the principle of part site generation and part bulk purchase. The estimated cost is £3,100.

Morecambe.—ILLUMINATION CHARGES.—The Electricity Committee has decided to charge 1d. per kWh for electricity for private installations during the autumn illuminations.

Mountain Ash.—LOW LIGHTING CHARGE.—A net rate of 1¼d. per kWh for lighting will be charged for the September quarter as a result of the Council's decision to increase the prompt-payment discount from ½d. to 1½d. per kWh (equivalent to £1,500). Mr. E. W. Jones, general manager of the electricity undertaking, informed the Council that the higher discount would not prevent a bonus being given to consumers next December at least equal to that last year (£4,000).

Southend-on-Sea pier centenary celebrations: A photograph of the illuminations taken last week from the pier-head

Newton-in-Makerfield.— ASSISTED - WIRING PROGRESS. — An outstanding feature of the undertaking's activities during the past financial year has been the progress in assisted wiring. Figures contained in the annual report of Mr. W. Phœnix, electrical engineer and manager, show that 811 installations were carried out (against 62), 4,806 lighting points being provided (371) and 926 plug points (89).

Northern Ireland.—AN ALL-ELECTRIC SANATORIUM.—Following consideration of a report by the city electrical engineer (Mr. F. H. Whysall) Belfast Tuberculosis Committee has decided that the municipal sanatorium shall be made all-electric. The cost of the necessary plant is estimated at £15,000.

ANNUAL REPORT.—A growth of 32 per cent. in the sales of the Belfast Electricity Department is recorded in the annual report of the city electrical engineer for the year ended March 31st last. Altogether 115,743,000 kWh was sold, compared with 87,175,000 kWh in the previous year. There were increases under all headings, the percentage figures being as follows:—Lighting, 9.26; domestic supplies, 24.15; general power, 17.7; shipyard supply, 93; tramways, 3.62; and bulk supply, 106.4. The revenue amounted to £481,747, an increase of £47,292, while the gross profit was £257,273, working expenses being up by £44,960, largely due to the higher cost of coal and greater consumption. The net surplus is shown as £59,500. The consumers at the end of the year numbered 37,491, an increase of 6,207. The engineer states that it will be necessary to provide additional boiler and coal-handling plant during the next eighteen months, and possibly turbo-alternator plant and buildings at the Harbour power station. The pro-

Municipal Supply Undertakings' Results

Town.	Engineer.	Total Revenue.		Working Expenses.		Net Profit.		Sales of Electricity.		
								Thousands of kWh.		Percentage Increase.
		1933/4.	1934/5.	1933/4.	1934/5.	1933/4.	1934/5.	1933/4.	1934/5.	
		£	£	£	£	£	£			
Barking	W. E. Kidner	92,335	103,302	53,999	61,045	17,578	17,983	11,368	14,170	24.8
Bath	J. W. Spark	144,832	148,281	70,933	93,128	16,720	7,727	32,469	37,308	14.9
Bingley	O. G. Cook	33,368	33,036	20,508	18,604	4,093	6,905	‡	‡	‡
Birmingham	F. Forrest	2,296,009	2,446,658	1,191,300	1,678,087	279,833	257,553	496,587*	553,064†	11.3
Blackburn	R. H. Harral	214,051	225,280	76,382	124,511	14,539	17,665	30,171	34,033	12.8
Bolton	H. E. Annett	323,876	316,928	163,186	183,861	34,775	13,876	75,350	74,877	−0.6
Bromley	W. G. Trend	75,517	82,780	44,477	52,886	10,910	7,045	8,878	10,339	16.4
Burnley	J. E. Starkie	110,652	117,438	66,591	73,209	13,812	14,231	15,352	17,180	11.9
Burton-upon-Trent ...	T. Hall	153,871	165,815	90,640	107,375	18,948	10,308	29,320	32,746	11.6
Bury St. Edmunds ...	A. E. Knights	‡	24,890	‡	13,762	‡	642	2,181	2,695	23.5
Colchester	W. Frisby	117,798	131,375	59,573	73,479	11,470	5,572	13,034	15,478	18.7
Dover	R. C. Harpur	56,476	64,062	32,129	39,797	6,652	6,411	4,223	5,648	33.7
Hampstead	J. Leadbeater	198,295	206,175	149,288	152,895	15,209	46,242	30,130	32,062	6.4
Kettering	W. A. Walker	109,482	144,888	59,075	87,467	10,239	12,514	13,534	30,999††	129.0
Leeds	C. Nelson Hefford ...	878,433	904,358	366,142	407,192	77,138	69,486	250,714	286,297	14.1
Leigh	J. B. Hudson	63,381	63,861	40,817	42,776	8,965	7,806	13,734	13,474	−1.9
Lincoln	F. Newey	124,203	132,665	90,502	83,132	3,036(loss)	9,008	19,334	23,527	21.7
Newton-in-Makerfield ...	W. Phoenix	24,449	25,837	17,568	19,457	2,125	1,243	4,564	4,927	7.9
Oxford	H. G. Fraser	164,996	186,526	84,213	93,124	28,963	43,000	38,984	47,558	21.9
Portsmouth	B. Handley	368,599	397,894	178,180	219,499	60,500	46,701	61,120	82,643	35.2
Rawtenstall	J. E. Shepherd	77,639	87,852	36,839	45,376	5,646	5,461	15,563	16,985	9.1
Southend-on-Sea ...	A. C. Johnson	256,328	281,072	119,250	153,622	35,684	6,011	31,391	39,380	25.4
Stafford	W. H. Robins	52,801	57,115	37,972	37,819	4,582	8,883	10,525	12,414	17.9
Stoke-on-Trent	C. H. Yeaman	264,203	294,572	164,471	185,482	33,728	38,809	57,555	67,136	16.6
Sunderland	W. A. Royle	194,952	204,276	105,546	108,642	15,584	26,010	34,480	38,688	12.2
Walsall	E. A. Newburn	161,230	161,466	97,343	109,141	26,740	16,067	25,826	28,320	9.7
Worcester	C. M. Shaw	109,655	119,054	50,107	68,741	17,215	16,682	19,492	21,045	7.9

* In addition to 22,409,675 kWh. taken by the Central Board. † In addition to 47,921,000 kWh. taken by the Central Board. ‡ Figures not available.
†† Including 15,439,000 kWh under the Corby Steelworks agreement.

vision for distribution purposes for the two years ending in March, 1937, is estimated at £240,000.

Redcar.—ILLUMINATIONS.—Workmen are now engaged in erecting 12,000 lamps for the forthcoming illuminations, which will be more brilliant than ever. Special apparatus is included to eliminate interference with wireless reception.

Richmond (Yorkshire).—REDUCED CHARGE.—As from October 1st the lighting flat rate is to be reduced from 5d. to 4½d. per kWh.

Russia.—ELECTRIFICATION PLANS.—According to the *Monthly Review* of the Moscow Narodny Bank twenty large districts are to be completely electrified during the present year. These districts are situated in the Dniepropetrovsk, Kiev and Odessa provinces, the Crimea and the Volga German Republic. Furthermore, 600 collective farms will be supplied with electric motors. Threshing of this year's crop yield will be carried out by 4,130 electrically operated machines, of which only 2,300 were in operation in the same territory last year.

South Africa.—KLERKSDORP SCHEME ABANDONED.—The Town Council of Klerksdorp has abandoned a proposal to increase its power supply plant. Instead, bulk supplies will be taken from the Victoria Falls and Transvaal Power Supply Co.

Southampton.—IMPROVING THE SUPPLY.—It is proposed to improve the supply in various districts at a total cost of £7,617.

Southport.—SUB-STATION.—The Electricity Committee is seeking sanction to borrow £9,300 for the provision of a sub-station at Radnor Drive.

Taunton.—WIRING SMALL DWELLINGS.—The Town Council is to apply to the Electricity Commissioners for sanction to borrow £3,000, required to carry out work of wiring small dwellings in the town. Occupants of 788 small houses are stated to have agreed to take advantage of the Council's wiring scheme.

Wallasey.—AVOIDING COMPETITION WITH GAS.—The Corporation has decided to appoint a special committee of nine members to report to the Council upon the desirability of passing a scheme to avoid unnecessary competition between the Gas Committee and the Electricity Committee.

Wanstead and Woodford.—ELECTRICITY CHARGES.—The Minister of Transport is being asked to investigate the charges of the County of London Electric Supply Co., Ltd., in the area. It is stated that a flat rate of 6d. per kWh is charged as compared with 3½d. and 4d. per kWh in adjacent areas, and that the two-part tariff does not meet the needs of 40 per cent. of the consumers.

West Ham.—LOWER CHARGES.—The Town Council has made the following reductions in electricity charges: Lighting by prepayment meter, from 4d. to 3½d. per kWh; with rental wiring installation, 5½d.; domestic tariff "unit" charge, from ½d. to ¼d.; rental wiring, from 7s. per point per annum for the first year and 4s. 8d. per annum thereafter to 4s. per point per annum.

Weymouth.—RURAL SUPPLIES.—The Electricity Committee has obtained consent to the erection of overhead lines in connection with the supply in the rural districts of Dorchester, Wareham and Purbeck.

Traction

Australia.—MELBOURNE CABLE TRAMWAYS CONVERSION.—The Melbourne and Metropolitan Tramways Board has now decided that, after the completion of the conversion of the Brunswick cable tramway to electric traction in April next, it will proceed to electrify the North Charlton and Collingwood cable routes, which terminate in Lonsdale Street.

Brighton.—TROLLEY-BUSES.—The Tramways Committee has decided to appoint a Trolley-bus Sub-Committee to consider and report upon proposed schemes outlining such extensions and new routes as may seem advisable, together with a report on the financial aspect of the proposed change-over to trolley-buses. A Trolley-bus Bill is being promoted in the next session of Parliament.

Hungary.—RAILWAY ELECTRIFIED.—The completion of the electrification of the railway line from Budapest to Hegyeshalom, on the Hungarian-Austrian frontier, was mentioned in our last issue. The *Financial Times* reports that at a ceremony to mark the event a special train conveyed the Minister of Commerce, leading railway officials, representatives of British and Hungarian electrical industry and members of the British Legation to Bánhida, where the power station was inspected. The electrification of the line, which is about 192km. in length, was carried out jointly by the Metropolitan-Vickers Electrical Co., Ltd., and Ganz & Co., of Budapest. The line is worked at present by 26 electric locomotives built on the Kando "split-phase" system. At a luncheon given at Győr, Mr. W. C. Lusk and Mr. P. S. Turner, directors of the Metropolitan-Vickers Electrical Co., were congratulated on the success of the undertaking.

Liverpool.—TRANSPORT INQUIRY.—At a Ministry of Transport inquiry held last week into the application of the Corporation for permission to carry out a number of tramway extensions it was stated that trams must be the main means of transport in Liverpool for a considerable number of years. The proposed extensions are for the purpose of affording facilities to about 100,000 persons transferred from the centre of the city to the large new housing estates.

NEW ROLLING STOCK.—The Transport Committee is to invite tenders for fifty new bogie, eight-wheel tram chassis, similar to those now in service. A number of the existing tramcars are being modernised.

London.—TRAFFIC SIGNALS.—An extensive system of traffic control costing nearly £40,000 and affecting fifty-five road junctions is shortly to be brought into operation in St. Marylebone. A new method is being adopted whereby, while the majority of the signals are linked up on the flexible-progressive principle, there is a variable time cycle which responds to the flow of traffic. Master controllers have been installed at Marylebone Circus and at the junction of Marylebone Road and Edgware Road. A certain number of signals will be timed by the master controller at Oxford Circus, and there will also be five vehicle-actuated signals at independent junctions.

Oldham.—ANNUAL REPORT.—Statistics contained in the annual report of Mr. J. F. Richards, general manager and engineer of the Transport Department, show that the total revenue from the tramways was £154,932 (against £153,883), working expenses amounting to £126,335 (£129,595). There was a gross profit of £28,597 (£24,288), and the net surplus of £8,734 (£8,036). Passengers carried numbered 26,794,000, as compared with 26,384,000.

Scotland.—RAILWAY ELECTRIFICATION CONFERENCE.—The directors of the L.M.S. and the L.N.E. Railway Companies have accepted an invitation from the Glasgow Corporation to send representatives to a conference to discuss proposals for the electrification of railways in Glasgow and the west of Scotland. In view of the decision of the Government to guarantee loans of £40,000,000 for the electrification of railways in London and district, the Corporation claims that the west of Scotland should receive special consideration because of the large number of unemployed in the area. It is believed that members of the Corporation have in view the question of the electrification of the Cathcart Circle and also the main line from Glasgow Central to Gourock.

Communications

Australia.—WIRELESS INTERFERENCE SUPPRESSORS.—The Federal Government has issued an ordnance empowering the Department of the Interior to compel anyone using electrical machinery to equip it with suppressors so as to avoid interference with wireless broadcast reception. This is the first time the Government has taken action in this direction. At present it applies only to the Federal capital of Canberra as the Federal authorities have no power to enforce such a regulation in the States, but it is understood that an approach is to be made to the State Governments seeking their co-operation in dealing with the matter.

Germany.—BROADCAST RECEIVERS.—The number of wireless receiving sets in Germany has risen rapidly since 1933, and the rate of increase was substantially increased during the first quarter of 1935 compared with the corresponding period last year, as shown by the following figures:—

	Number of Receivers.	Number per 1,000 population.	Increase %
Jan. 1st, 1934	5,051,607	77.7	6.1
Mar. 1st, 1934	5,364,557	81.2	
Jan. 1st, 1935	6,142,921	93.0	7.4
Mar. 1st, 1935	6,599,721	99.8	

The number per 1,000 inhabitants rose from 40.8 at the beginning of 1929 to 54 on January 1st, 1931, and 61, 66.2, 77.7, and 93 on January 1st, 1932-35, inclusive.

Great Britain.—A TELEVISION CABLE.—In an address at Wolverhampton last week Sir Donald Banks, director-general of the Post Office, stated that a cable capable of carrying television programmes is to be laid between London and Birmingham. The cable will be two inches in diameter and will consist of a single insulated wire and with an outer covering of flexible tube. Nineteen repeater points will be necessary, compared with two on ordinary trunk telephone lines between the same towns. When not used for television purposes the cable will be able to carry 200 simultaneous telephone conversations.

Iceland.—COMMUNICATIONS CONFERENCE.—At a telegraph and telephone conference of representatives of the Northern countries, held at Reykjavik, discussion took place concerning the establishment of a direct telephone cable connection over the North Sea between the Northern countries and England. The scheme has been worked out by the Danish engineer, Mr. Kay Christiansen, and the conference requested the Danish Telegraph Administration to seek co-operation with England in the matter. At present communication takes place *via* Germany and Holland.

RADIO-TELEPHONE SERVICE.—A radio-telephone service between England and Iceland has been inaugurated, the equipment employed being supplied from England by the Marconi Co. The Icelandic station is situated near Reykjavik, and, in addition to communication with England, provision has been made for radio-telephone communication between the principal centres in Iceland itself. Also, the new stations will be used for short-wave broadcasting and for the transmission of weather bulletins.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Aberdare.—August 17th. Electricity Department. 6,600-V cable. (See this issue.)

Annfield Plain.—U.D.C. 134-kVA transformer. Electrical engineer.

Argentina.—BUENOS AIRES.—September 9th. State Railways. Electric generating sets, rotary pump, electric motors, switchboards, &c. (T.Y. 5100.)*

Australia.—MELBOURNE.—State Electricity Commission of Victoria. September 16th. Compound filled switchgear and accessories. (T.Y. 5045.)*

November 11th. Four water-tube boilers for the Yallourn power station. Agent-General for Victoria, Victoria House, Melbourne Place, W.C.2 (deposit £6 6s.).

Posts and Telegraph Department. September 3rd. Motor-generators and rectifiers. (T.Y. 5083.)*

Bedfordshire.—August 19th. County Council. Heating and hot water supply and electric lighting and wiring at the new Council school, Stewartby. Specifications from O. P. Milne, 64, Wigmore Street, London, W.1, on and after August 6th.

Brighton.—August 19th. Corporation. Switchboard. (See this issue.)

Congleton.—August 23rd. Electricity Department. 500-kVA transformer. (See this issue.)

Dundee.—August 14th. Electricity Department. 6,600-V and 660-V cable. (July 26th.)

Egypt.—September 10th. Mechanical and Electrical Department, Ministry of Public Works. Electrical pumping station complete with building works, machinery and accessories at Rasheed Drain. Chief inspecting engineer, Egyptian Government, 41, Tothill Street, S.W.1 (deposit £1 10s. 9d., not returnable).

CAIRO.—Ministry of the Interior. September 9th. Electrical network for Zagazig. (T. Y. 5049.)*

October 3rd. Electrical equipment required in connection with the erection of a sub-station at Mehella-el-Kobra. (T.Y. 5084.)*

Epsom and Ewell.—August 8th. Electricity Department. One e.h.p. truck type cubicle, modifications to existing switchgear and l.p. cable. (July 26th.)

Fort William.—August 5th. Town Council. Electrical work at Upper Achintore housing scheme. A. Forrester, Burgh surveyor.

Glasgow.—September 10th. Electricity Department. Turbo-alternator plant and boiler house plant and buildings. (July 26th.)

Hastings.—August 8th. Electricity Department. Switch and transformer kiosk. (July 26th.)

Honley.—August 20th. Electricity Department. Automatic voltage regulation transformer. (July 26th.)

India.—SIMLA.—Indian Stores Department. August 27th. Electrically driven gear sets for punkahs. (T.Y. 10004.)*

August 9th. Copper cables. (T.Y. 10005.)*

BOMBAY, BARODA & CENTRAL INDIA RAILWAY CO.—August 28th. Sub-station equipment and track sectioning switchgear. (See this issue.)

Irish Free State.—DUBLIN.—August 23rd. Electricity Supply Board. 38,000-V switchgear equipment for a new indoor station and control room equipment for Pigeon House station. (July 19th.)

Lanarkshire.—County Council. Contractors wishing to tender for various works, including electrical, at housing schemes comprising 318 dwellings, should communicate with P. C. Smith, Council and town planning engineer, 13, Clydesdale Street, Hamilton, by August 5th.

Lancaster.—August 12th. R.D.C. Electrically operated automatic sewage plant for the Slyne-with-Hest sewerage scheme. H. B. Ward, 26, North John Street, Liverpool (deposit £5 5s.).

Leeds.—August 20th. Electricity Department. 30,000-kW turbo-alternator and exciter surface condensing plant, and other accessories. (July 19th.)

Leyton.—August 9th. Electricity Department. Transformers, e.h.p. and l.p. switchgear, motors, and rectifier units for radio receivers. (July 26th.)

Littlehampton.—August 14th. U.D.C. Parade lighting. (See this issue.)

London.—FULHAM.—August 12th. Borough Council. Transformers. (July 19th.)

Newport (I. of W.).—August 16th. Town Council. Duplicate borehole pumps and vertical-spindle booster pump with engines and bevel gear units and duplicate auxiliary sets, generators, switchboard, battery, wiring, lighting, &c. Sandford, Fawcett & Partners, 53, Victoria Street, S.W.1 (deposit £5 5s.).

New Zealand.—WELLINGTON.—Public Works Tenders Board. October 8th. 1,500-kVA transformer. (A.Y. 13167.)*

October 22nd. Oil-immersed 11,000-V solenoid-operated circuit-breaker. (T.Y. 5062.)*

November 19th. Three 1,667-kVA outdoor type transformers. (T.Y. 10009.)*

Posts and Telegraph Department. September 18th. Telephone instrument cords. (T.Y. 5053.)*

September 19th. Condensers. (5080.)*

October 2nd. P.i. l.c. telephone cable. (T.Y. 10006.)*

October 14th. 2,000 wall pattern magneto telephones. (T.Y. 10007.)*

Public Works Department. October 29th. Three 50-kV outdoor type potential transformers. (T.Y. 10008.)*

Northern Ireland.—LISBURN AND BELFAST.—August 17th. Regional Education Committee. Electric lighting and l.p. hot-water heating installations at new public elementary school. R. Ferguson, architect, 36, Scottish Provident Buildings, Belfast.

BELFAST.—August 17th. Electricity Department. Water cleaning screens for the Harbour power station. (See this issue.)

Portsmouth.—August 9th. Electricity Department. 5,000-kVA transformer. (See this issue.)

St. Helens.—September 2nd. Corporation. Stoneware ducts and cable protection tiles. (July 19th.)

Selby.—August 9th. Electric lighting at Drax Grammar school, house and buildings. E. & T. Clark, solicitors, Snaith.

Sheffield.—August 15th. Electricity Department. Six 500-kVA transformers. (July 26th.)

Sturminster.—August 14th. R.D.C. Engine-house installation for the water supply, consisting of duplicate set of electrically driven motors and pumps with automatic control apparatus and a stand-by Diesel engine. A. J. Allen, engineer, Half Moon Street, Sherborne (deposit £2 2s.).

Sunderland.—August 19th. Electricity Department. Cookers, water heaters, wash-boilers and irons. (July 26th.)

September 2nd. Electricity Department. Cable, wire, meters and lamps. (See this issue.)

Swinton & Pendlebury.—August 14th. Electricity Department. Transformers and voltage regulating equipment. (See this issue.)

Taunton.—August 15th. Electricity Department. Transformers and cable testing equipment. (See this issue.)

August 26th. Electricity Department. Electric lighting installations in small dwellings. A. J. Howard, borough electrical engineer, 1, St. James's Street.

Uruguay.—MONTEVIDEO.—State Electricity Supply and Telephones Administration. August 31st. P.i., l.c. and armoured cable with joint boxes and accessories. (T.Y. 5063.)*

September 16th. H. and l.p. cables. (T.Y. 5065.)*

West Ham.—August 26th. Electricity Department. Meters, transformers, wires and cables. (See this issue.)

Yorkshire.—August 26th. West Riding County Council. L.p. hot water apparatus and electric lighting at the extensions of Conisborough Senior Council school and the Normanton New Senior school. Education officer, County Hall, Wakefield.

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* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Australia.—COMMONWEALTH.—P.M.G.'s Department. Accepted. Reactances (£1,016), carrier telephone equipment (£6,165) and telephones and dials (£4,375).—Standard Telephones & Cables (A'sia), Ltd. Carrier telephone equipment (£1,679).—British General Electric Co., Ltd. Wire (£8,566).—W. T. Henley's Telegraph Works Co., Ltd. Telephones and dials.—Automatic Telephones, Ltd. (£9,860); Ericsson Telephone Manufacturing Co. (£9,053).

MELBOURNE.—City Council. Accepted. Ring main switch units with accessories (£2,932).—British General Electric Co., Ltd. Cable.—Liverpool Electric Cable Co., Ltd.—*Tenders.*

Bexley.—U.D.C. Accepted. Cables during the period ending July 31st, 1936 (£15,226).—Johnson & Phillips, Ltd.

Durham.—County Council. Accepted. Electric lighting in schools.—Reid Ferens & Co., Ltd. (£193); Falconar Cross & Co. (£554); Seymour & Warren (£180).

Hull.—Housing Committee. Accepted. Electric lighting at artisans' dwellings in Great Passage Street (£337).—T. A. Garness.

Keighley.—Electricity Committee. Accepted. Transformers and motors for twelve months.—General Electric Co., Ltd.

Kingston-on-Thames.—Town Council. Accepted. Street-lighting equipment (£2,264).—British Thomson-Houston Co., Ltd.

London.—ST. MARYLEBONE.—Electricity Committee. Recommended. Cables in connection with the Middlesex Hospital supply (£550).—Enfield Cable Works, Ltd. Meters for twelve months.—Chamberlain & Hookham, Ltd.; Ferranti, Ltd.

STEPNEY.—Electricity Supply Committee. Recommended. Alterations to e.h.p. feeder switchgear at the Limehouse generating station (£247).—A. Reyrolle & Co., Ltd. L.c. cable for the Central sub-station (£253).—W. T. Henley's Telegraph Works Co., Ltd.

Baths and Washhouses Committee. Recommended. Thirty-four electric synchronised clocks for the Whitechapel, St. George's and Radcliffe baths (£194).—Synchronome Co., Ltd.

Manchester.—Electricity Committee. Accepted. For Stuart Street power station: H.p. testing equipment.—British Electric Transformer Co., Ltd. Sub-contractors: Voltage regulator.—Switchgear & Cowans, Ltd. Isolating links and overcurrent relays.—Crompton Parkinson, Ltd.

Electrical telegraphs.—Chadburn's (Ship) Telegraph Co., Ltd. One 200-kW mercury arc rectifier equipment for Bradford Road gas works sub-station.—Electric Construction Co., Ltd. Repairs to transformer at Denton West sub-station.—Ferranti, Ltd. Additions and modifications to 33,000-V switchgear at Stuart Street and main transformer sub-stations.—Ferguson, Pailin, Ltd.; A. Reyrolle & Co., Ltd. Modifications to 6,600-V switchgear at Oldham Road "B" sub-station.—A. Reyrolle & Co., Ltd. Cables.—Connollys (Blackley), Ltd.; Derby Cables, Ltd.; W. T. Glover & Co., Ltd. Twelve months' supply of weldless steel lamp columns.—Bromford Tube Co., Ltd.; British Mannesmann Tube Co.

Health Committee. Accepted. Change-over of supply at Langho Colony.—Bertram Thomas.

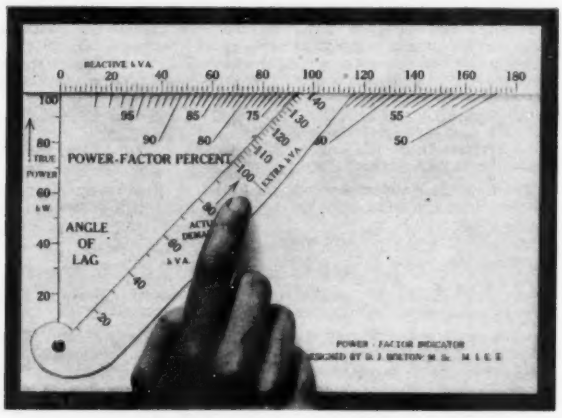
Notes

The Central Board's Finances

In our last issue we reported criticism by Mr. I. M. Horobin, M.P., of the form in which the Central Electricity Board's accounts were published and the reply by Capt. R. S. Hudson, Parliamentary Secretary to the Minister of Transport. It is now reported that Mr. Horobin and four Conservative members have tabled a resolution asking the Minister of Transport to prescribe that the Board's accounts shall be prepared in such a way as to show the purchases, sales and revenue for each area and a clearer analysis of capital expenditure.

Demonstrating Power Factor

A device designed by Mr. D. J. Bolton, of the Regent Street Polytechnic aims at demonstrating the meaning and effect of lagging power factors and the incidence of the kVA tariff. It



A power-factor indicator

consists essentially of a swivelling arm working over a cardboard base. The inclination of the arm represents the current direction, lagging behind the (vertical) voltage direction. The angle between them is scaled not in degrees but in power factor per cent. On the arm is a scale of demand kVA corresponding to 100 kW true power. All the figures beyond the 100 mark are shown in red and are entitled "extra kVA." On a two-part tariff in which the fixed charge is based on the kVA of demand the consumer has to pay for all these extra kVA at the full rate. A horizontal red scale which bridges over the moving arm shows the reactive kVA for the same true power demand of 100 kW. The distance in this direction is a measure of the magnetising component of the motors employed, and it will similarly show the improvement in power factor and the reduction in extra kVA due to a given installation of condensers. The economics of power factor improvement can thus be readily demonstrated, wherever there is a kVA tariff or a power-factor penalty clause. The indicator aims primarily at a visual exposition, however, and does not compete with the slide rule for exact calculation. This device should be of considerable service to consumers' engineers, the condenser salesmen, and educational and publicity bodies who have to expound the mysteries of power factor. It can be obtained at 3s. (postage 3d.) direct from the designer, or from Messrs. Chapman & Hall, Ltd., 11, Henrietta Street, W.C.2.

A Large Aerodrome Clock

A clock which is said to be the largest electrically controlled timepiece yet made is being tested at Leicester prior to being shipped to South Africa, where it will be erected at the new Rand Airport. The clock has a dial 30 ft. in diameter, the minute hand being 17 ft. and the hour hand 14 ft. 6 in. long. It will be erected horizontally and airmen flying at 3,000 ft. will be able to read the time.

Air-conditioned Trains

Railway carriages equipped with air-conditioning plant have just been put into service both in Ireland and Germany. On the Great Northern Railway express service between Dublin and Belfast first- and second-class compartments, which are of the side-corridor type, have their air filtered twice and its temperature controlled before admittance. Experiments for the German railway company are being carried out on electric trains operating on the Leipzig-Halle line.

Fatality

An inquest was held on July 23rd at Westminster, by Mr. Ingleby Oddie, the Westminster Coroner, on Walter Edward Cook (45), a cable jointer employed by the Westminster Electric Supply Corporation, Ltd., who recevied a fatal electric shock whilst working on a junction box. His foreman, Herbert S. Morton, in giving evidence said that, after testing, deceased would put in solid connecting links to make the phase "alive" and would then couple through. He was putting the isolating links in when the accident happened. On examining the box afterwards witness found that the standards in the link box were burned off. He found an uninsulated screwdriver some of the metal of which had fused. He was of the opinion that Cook was pulling a link out, but finding it was stiff, tried to prise it with the screwdriver, and touching the iron case of the link-box, caused a short circuit. The men were supplied with rubber mats, gloves, shoes, and rubber-lined sacks to sit on, and there was an insulated screwdriver in the box that Cook could have used. A verdict of "Accidental death" was recorded.

English Electric Engineering Society

The Stafford Works Engineering Society of the English Electric Co., Ltd., held its annual meeting on July 17th, Mr. F. Wallis occupying the chair. The chairman remarked upon the rapid growth of the Society, the membership for the last session being the highest ever recorded. The officials for the coming session are: President, Mr. G. H. Nelson; vice-presidents, Messrs. F. Wallis and W. E. Milton-Ayres; hon. secretary, Mr. H. Stanier.

The Ampère Centenary

The city of Lyons is making preparations to celebrate at the international fair to be held in that city in March, 1936, the centenary of the death of André-Marie Ampère.

E.A.W. Examination Results

Of the sixty-eight candidates for the Electrical Association for Women certificate examination for demonstrators and saleswomen held on June 20th fifty-three were successful, two obtaining distinction. In the examination for domestic science and science teachers held on June 27th fifty-two of the fifty-nine candidates passed, two also with distinction. The next E.A.W. examination for demonstrators and saleswomen will be held on December 12th and that for teachers on January 16th, 1936.

Electrical Domestic Science

Mr. E. E. Hoadley, M.I.E.E., Mr. R. S. Downe, M.I.E.E., Col. R. E. Crompton, C.B., and Mr. D. Acworth were among the visitors at the end-of-term distribution of prizes at the London School of Electrical Domestic Science on July 26th. The principal, Miss H. M. M. Minoprio, reported that seventeen students were leaving the school this term. Nine had been awarded first-class certificates, three obtaining distinction in electricity, one in cookery demonstration and theory, one in practical cookery, laundry and housewifery, one in practical cookery, and one in general demonstration.

Regional Planning and Railway Transport

In one of the papers presented at the fourteenth International Housing and Town Planning Congress, which met at the Royal Institute of British Architects in London from July 16th to 20th, Messrs. G. G. Clark and E. W. Ashcroft dealt with "Regional Planning and Railway Transport." The authors were not concerned with technical and economic advantages of railway electrification, which were acknowledged. Their object was not to discuss the methods that the railway companies should adopt so much as the service they were required to fulfil. It was necessary to decrease the journey time and increase the frequency of services. The underlying cause of street congestion was the fact that only about 26 per cent. of the total number of passenger journeys in the London area was made on the Underground and suburban sections of the main-line railways. Speed of travel was an essential to the proper functioning of a metropolitan area. The Underground and suburban railways could only perform the service demanded of them when there was complete interconnection. Representations had been made with a view to the electrification of the railways around Manchester. The amenities of the Altrincham district and the possibilities of planned development had decidedly improved since the electrification of that line. A subsidiary reason for the desertion of the railways at rush hours and the consequent overcrowding of the roads in the Manchester area was the irregularity of the steam suburban services during fog. More punctual and more frequent service would result from electrification.

Appointments Vacant

Uniformed inspectors and consumers' engineer for the Heston and Isleworth Electricity Department.

Consumers' engineer for West Gloucestershire Power Co.

Electrical engineer for the Gold Coast (Crown Agents for the Colonies).

Assistant lady demonstrator for Exeter Electricity Department.

Technical assistant and sub-engineers for New Scotland Yard.

Assistant master in mathematics and electrical engineering at South-East London Technical Institute for the L.C.C.

Borough electrical engineer for Finchley.

Deputy electrical engineer for Erith U.D.C.

(See our classified advertisements.)

Makers' Names Wanted

APOLLO electric fire.

EDKAY vacuum cleaner.

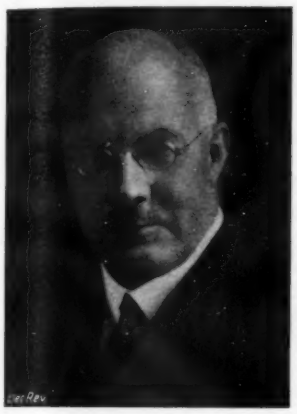
E.P.E. and BEACON electric polishing motors.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. C. G. Morley New attended a meeting of the Cardiff City Council on July 26th and was presented by the Lord Mayor (Alderman John Donovan) with an illuminated address upon vacating the position of city electrical engineer to become an Electricity Commissioner. In returning thanks, Mr. Morley New said that he had spent thirty-three years in Cardiff, and during the fifteen years that he had been electrical engineer and manager the number of electricity consumers in the city had increased nearly ten times, the output had gone up seven and a half times, and the revenue had more than doubled. Thanks to new works at Cardiff Docks, the output might be almost doubled in the near future. On the previous day Mr. Morley New was the guest of honour at a luncheon given by some of his friends in the South Wales electrical and allied industries, the chairman being Mr. C. T. Allan (South Wales Electric Power Co., Ltd.). The chairman proposed a toast to Mr. Morley New, and then presented him with a gold pen and pencil. Speeches were also made by Major J. Wayne Morgan and by Mr. A. C. McWhirter.

Sir William Ray, M.P., Executive Chairman of the British Electrical Development Association, was recently married in Paris to Mrs. Huitfeldt, formerly Miss Eileen Wilson of Birkenhead.



Elliott & Fry.

Sir Harold Hartley

Sir Harold Hartley, C.B.E., F.R.S., chairman of the British National Committee of the World Power Conference, was, on July 17th, elected as chairman of the International Executive Council. The election took place at the annual meeting held at The Hague. Sir Harold, of course, succeeds the late Mr. D. N. Dunlop, the founder of the Conference. As a vice-president and director of research of the L.M. & S. Railway Co., he is in close touch with industrial problems; he is also chairman of the Fuel Research Board.

M. Paul Janet and Dr. Elihu Thomson were elected honorary presidents of the Commission Electrotechnique Internationale at a meeting recently held in Brussels. M. Janet is a member of the Institut de France and a well-known French electrical engineer who has done valuable work in connection with the drawing up of an international electro-technical vocabulary. Dr. Elihu Thomson is, of course, the American electrical engineer well known on both sides of the Atlantic.

Mr. D. M. Touche, managing director of the Sphere Investment Trust, has been elected chairman of the company in succession to the late Sir George Touche.

Mr. P. A. McKillop, who for the last thirty-five years has represented the Vacuum Oil Co. in Scotland, has retired. At the Grosvenor Restaurant, Glasgow, on July 30th, a complimentary dinner was given in his honour, when Mr. A. S. Giffen, manager for Scotland, presented him with a wireless set as a token of esteem from his colleagues. Mr. McKillop is an active member of the Institution of Engineers and Shipbuilders and the Institution of Electrical Engineers.

Mr. D. C. McLennan, Birmingham branch manager of Messrs. Johnson & Phillips, Ltd., obtained second prize with his Daimler car in the Midlands Concours d'Elegance (£400-£500 class)

In our last issue we recorded that **Mr. V. Watlington** had been invested, as director, with the entire control of the management of the organisation of B.E.A.M.A., and that **Mr. C. Rodgers** had been appointed Deputy Director. We now reproduce the portraits of these gentlemen. Mr. Rodgers will continue to act as secretary of the Association.

Rotogravure

Mr. V. Watlington **Mr. C. Rodgers**

Mr. G. L. E. Metz, A.M.I.E.E., who has resigned his position with the Metropolitan-Vickers Electrical Co., was presented, on July 26th, by Mr. T. T. Evans, on behalf of his colleagues at Trafford Park, with a folio case and cabin trunk. Mr. Metz is going to Australia.

Mr. G. Appleton has been presented with a gold watch and chain, subscribed for by one hundred of his colleagues, as a mark of their esteem on his recent retirement after thirty-eight years in the service of the Notting Hill Electric Lighting Co., Ltd.

Mr. C. R. Stevenson, engineer in charge of the Maldon district of the County of London Electric Supply Co., Ltd., was married at Woodham Mortimer on July 20th to Miss E. N. Stevens. He has been presented with a mirror by the Chelmsford staff and with an electric clock by the Maldon staff.

Mr. E. G. S. Dangerfield has been appointed secretary of the Westminster Electric Supply Corporation, Ltd.

Obituary

Mr. C. E. Stromeyer.—The death occurred at Bad Nauheim on July 23rd, at the age of seventy-nine, of Mr. Charles Edmund Stromeyer, M.Inst.C.E., M.Inst.M.E., for over thirty years chief engineer of the Manchester Steam Users' Association. Mr. Stromeyer, who was born at Sutton, Surrey, served his apprenticeship in London and studied engineering at Aix-la-Chapelle. In 1880 he became engineer surveyor to Lloyd's Register of Shipping. He was a past member of the Institute of Naval Architects and a past president of the Manchester Association of Engineers. He was the author of numerous scientific papers, his subjects including the working and ageing of mild steel and the fatigue of metals. His work on "Marine Boiler Management and Construction" is a standard work of reference. He was awarded the Telford Medal and two Telford Premiums by the Institution of Civil Engineers.

Mr. A. C. Gilling.—The death occurred on July 19th, after a few days' illness, of Mr. Algernon Coote Gilling, who was associated with Messrs. Robert Hornby & Co., Ltd. He was in excellent health when present at the company's outing at Clacton on June 29th, and his death came as a shock to his colleagues and other friends. Before joining Messrs. Hornby, Mr. Gilling, as will be remembered, was prominent among electricity works engineers, being "chief" at Epsom for several years at a time when Diesel engine-users were coming into counsel together. During the war he served with the old Queen's Westminsters, and later in the Royal Flying Corps (now the R.A.F.), attaining the rank of captain. He was born in 1882 and received his electrical training at Finsbury Technical College.

Miss C. Marryat.—We regret to learn of the death of Miss Cecily Marryat, aged thirty-two, daughter of Mr. and Mrs. H. Marryat, which occurred on July 28th at Richmond. Mr. Marryat's many friends in the electrical industry will join us in expressing sympathy with Mr. and Mrs. Marryat in their bereavement.

Prof. R. Goldschmidt.—The death is reported from Nice of Prof. Robert Goldschmidt, a leading Belgian authority on radio communication and founder of the Union Radioscientifique Internationale.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Electricity Consumers' Association, Ltd.—Public company. Registered July 27th. Nominal capital £25,000 in £5 shares. Objects: To protect the interests of actual, prospective or potential consumers of electricity and power in Great Britain and the British Empire, to form or assist in the formation of similar organisations, to print and publish newspapers, books and leaflets, and to undertake propaganda by personal or written appeals, wireless broadcasting, cinematograph films, public meetings, advertisement, &c. The first members of the Executive Committee are: Sir Cecil Partridge, K.B.E., J.P., 1, Cornwall Terrace, N.W.1, R. C. Hawkin, 28, Gunterstone Road, W.14, A. F. Pool, C.B.E., Kenmuir, Manor Way, Beckenham, Kent, G. A. Lansdown, J.P., F.R.I.B.A., F.S.I., 9, Regent Street, S.W.1, and Sir Louis S. Johnson, Coombe Pines, Coombe Warren, Kingston Hill, Surrey. Registered office: 3, Fredericks Place, Old Jewry, E.C.2.

Evesham Radio Relay Service, Ltd.—Private company. Registered July 22nd. Capital, £750 in £1 shares. Objects: To construct and maintain wireless signal stations, &c. The directors are: E. W. A. Thomas, 14, Badsey Lane, Evesham, and two others. Registered office: 46a, Bridge Street, Evesham, Worcs.

Beers Radio, Ltd.—Private company. Registered July 23rd. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of, agents for and dealers in wireless apparatus, electrical fittings, gramophones and records, &c. H. A. Beers, 83, High Storrs Road, Sheffield, is permanent managing director. Solicitors: J. W. Fenoughty, Ashton & Co., 7, Bank Street, Sheffield.

Campbeltown & Mid-Argyll Electric Supply Co., Ltd.—Public company. Registered July 22nd with a nominal capital of £10,000 in £1 shares. Objects: To carry on the business of an electricity supply company in all its branches. The directors are: L. Giacomuzzi, North House, Grantham, and C. E. Maguire, Duskins, Astons Road, Moor Park, Northwood, Middlesex.

Sykes & Dyson, Ltd.—Private company. Registered July 20th. Capital, £5,000 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, suppliers of electricity, carriers of passengers and goods, &c. The subscribers are: G. Laycock, 13, Lyndale Avenue, Birkby, Huddersfield, and A. Brooke, 26, Sufton Street, Birkby, Huddersfield. Registered office: Queen's Mill Road, Huddersfield.

Teddington Controls, Ltd.—Private company. Registered July 25th. Capital, £10,000 in 1s. shares. Objects: To carry on the business of manufacturers, importers and exporters of and dealers in all kinds of thermostatic and engineering apparatus, mechanical and electrical engineers, &c. The directors are: M. Payne, 50, Hook Road, Surbiton, and W. A. Payne, "The Tiles," The Avenue, Sunbury-on-Thames. Secretary: F. G. Poplett. Registered office: Windmill Road, Sunbury, Middlesex.

Testi & Sons, Ltd.—Private company. Registered July 24th. Capital, £500 in £1 shares. Objects: To acquire the business of electrical and mechanical engineers and millwrights, now carried on by G. C. Testi and G. D. Testi, at 69/73, Bevenden Street, East Road, Hoxton, as "Testi & Sons." The permanent directors are: G. C. Testi, 11, Rosendale Road, Epsom, Surrey, and G. D. Testi, 64, Gayfere Road, Stoneleigh, Surrey. Registered office: 69/73, Bevenden Street, East Road, Hoxton.

A. Anderson & Son (Electrical Engineers), Ltd.—Private company. Registered July 26th. Capital, £3,000 in £1 shares. Objects: To carry on the business of electrical engineers and contractors, &c. The directors are: A. Anderson (permanent managing director), "Southlands," 2, Walton Avenue, Linthorpe, Middlesbrough, and E. A. Anderson, "Southlands," 2, Walton Avenue, Linthorpe, Middlesbrough. Registered office: 100, Grange Road, Middlesbrough.

Drabble's Radio, Ltd.—Private company. Registered July 26th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in gramophones, electric accumulators and batteries, electricians, radio and electrical engineers, &c. The directors are: D. W. C. Drabble, Bank House, Bath Street, Bakewell, and two others. Registered office: 7, Brazennose Street, Manchester.

Greenly Engineering Models, Ltd.—Private company. Registered July 27th. Capital, £1,000 in £1 shares. Objects: To acquire any patents, &c., and to carry on the business of electrical, mechanical and consulting engineers, manufacturers of all kinds of electrical accessories and equipment, &c. The directors are: H. Greenly, K. H. Greenly, and Mrs. L. M. Greenly, all of 66, Heston Road, Heston, Hounslow, Middlesex, and E. A. Steel, 6, Summerleys Road, Princes Risborough, Bucks. Registered office: 66, Heston Road, Heston, Hounslow, Middlesex.

Returns of Electrical Companies

Werneth Electrical Engineering Co., Ltd.—L. Slater, 4, Clegg Street, Oldham, ceased to act as receiver on July 16th, 1935.

Emerson Electric Co., Ltd.—S. F. Homewood, 4, Burlington Street, W.1, was appointed receiver and manager on July 18th, 1935, under powers contained in debenture dated November 19th, 1934.

Laurence, Scott & Electromotors, Ltd.—Particulars filed of debentures not exceeding £150,000, authorised July 17th, 1935, constituting a first floating charge on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £120,000.

Worcester Radio Relay Service, Ltd.—The nominal capital has been increased by the addition of £900 in £1 ordinary shares beyond the registered capital of £100.

Bognor Regis Rediffusion Service, Ltd.—The nominal capital has been increased by the addition of £5,000 in £1 ordinary shares beyond the registered capital of £5,000.

Multiplex (Yorkshire), Ltd.—The nominal capital has been increased by the addition of £1,000 in £1 ordinary shares beyond the registered capital of £2,000.

All-Power Transformers, Ltd.—Capital, £100 in £1 shares. Return dated December 31st, 1934 (filed March 28th, 1935). All shares taken up. £100 paid. Mortgages and charges nil.

New Era Wireless & Electrical Co., Ltd.—Capital, £500 in £1 shares. Return dated July 30th, 1934 (filed April 27th, 1935). All shares taken up. £500 paid. Mortgages and charges nil.

Surrey Wholesale Electrical Co., Ltd.—Capital, £1,000 in 500 "A" shares of £1 and 10,000 "B" shares of 1s. Return dated November 7th, 1934 (filed May 3rd, 1935). 451 "A" and 8,600 "B" shares taken up. £275 paid on 101 "A" and 3,600 "B" shares, £600 considered as paid on 350 "A" and 5,000 "B" shares. £6 calls unpaid. Mortgages and charges nil.

Electric Light Insurance & Maintenance Co., Ltd.—Capital, £5,000 in £1 shares. Return dated December 29th, 1934 (filed April 1st, 1935). 1,755 shares issued and fully paid up. Mortgages and charges: 1st mortgage debentures £878 8s.; 2nd mortgage debentures, £970.

Artic Fuse & Electrical Manufacturing Co., Ltd.—Capital, £5,000 in 4,700 ordinary and 100 deferred ordinary shares of £1 and 4,000 founders' shares of 1s. Return dated December 31st, 1934 (filed March 15th, 1935). 2,683 ordinary, 100 deferred ordinary, and 2,183 founders' shares taken up. £2,079 13s. paid on 1,983 ordinary and 1,933 founders' shares, £812 10s. considered as paid on 700 ordinary, 250 founders' and 100 deferred ordinary shares. Mortgages and charges nil.

Standard Radio Relay Services, Ltd.—Satisfaction in full on July 12th, 1935, of debenture authorised October 31st, 1933, and registered November 17th, 1933, securing £70,000 and premium.

Edison Bell (International), Ltd.—Percy F. Quinton, 9, Baldwins Gardens, E.C.1, was appointed receiver and manager on July 17th, 1935, under powers contained in debenture dated December 15th, 1933.

Bulle Co., Ltd.—R. M. Honeybone, 110, Cannon Street, E.C., was appointed receiver on July 20th, 1935, under powers contained in debentures dated July 29th, 1931, and March 16th, 1934.

Frinton & Walton Radio, Ltd.—C. L. Nankivell, 5, Arcade Street, Ipswich, was appointed receiver and manager on July 22nd, 1935, under powers contained in debenture dated April 6th, 1935.

Peerless Electrical Manufacturing Co., Ltd.—Satisfaction in full on October 20th, 1934, of 1st mortgage debenture dated May 22nd, 1928, and agreement supplemental thereto, dated June 8th, 1929, and registered May 24th, 1928, and June 28th, 1929. (According to the register of mortgages, the debenture and agreement registered May 24th, 1928, and June 28th, 1929, originally secured all moneys due to bank.)

Initial Radio Service, Ltd.—The nominal capital has been increased by the addition of £1,500, in £1 ordinary shares, beyond the registered capital of £3,500.

Knightshades, Ltd.—The nominal capital has been increased by the addition of £3,500, in £1 ordinary shares, beyond the registered capital of £3,500.

Brentwood District Electric Co., Ltd.—The nominal capital has been increased by the addition of £70,000, in £1 ordinary shares, beyond the registered capital of £80,000.

Light Production Co., Ltd.—The nominal capital has been increased by the addition of £15,000, beyond the registered capital of £40,000. The additional capital is divided into 60,000 ordinary shares of 5s. Each of the existing ordinary shares have been subdivided into four shares of 5s. each.

Radiolight, Ltd.—Capital, £5,000 in £1 shares (increased and reorganised from £100 in 1s. shares, February, 1935). Return dated December 31st, 1934 (filed May 1st, 1935). £5 shares taken up. £5 paid. Mortgages and charges nil. A further 2,991 shares of £1 were allotted, payable in cash and fully called up on February 25th, 1935.

Heath Electrical & Gramophone Co., Ltd.—Particulars filed of £200 debentures authorised June 27th, 1935, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

G. H. Gibson, Ltd.—O. C. James, Arcade Chambers, Central Street, Caerphilly, was appointed receiver and manager on July 22nd, 1935, under powers contained in debenture dated June 11th, 1934.

Safety Electrical Appliances, Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1934 (filed April 17th, 1935). Two shares taken up. £2 paid. Mortgages and charges nil.

Nefa Co., Ltd.—Capital, £1,000 in £1 shares. Return dated January 14th, 1935. 999 shares taken up. £999 paid. Mortgages and charges: £500.

National Radio Co., Ltd.—Capital, £100 in £1 shares. Return dated January 2nd, 1935. Two shares taken up. £2 paid. Mortgages and charges nil.

White, Jacoby & Co., Ltd.—Capital, £7,500 in £1 shares. Return dated January 10th, 1935. 5,794 shares taken up. £3,437 paid, £2,357 considered as paid. Mortgages and charges: £1,200.

City Notes

Falk, Stadelmann & Co., Ltd.—Presiding at the annual meeting held on July 25th Mr. Max Falk (chairman) said that the company had benefited from the general revival in trade throughout the country. Keen competition, however, had been encountered in a good many of the commodities which they handled, and consequently in many instances prices had been on a low level. Their trading in overseas markets had not met with the success that they anticipated, with the exception of South Africa, where a good demand for their products had been experienced and sales had appreciably increased. The results from this improvement were not reflected in the accounts under review, no dividend having been declared by the South African subsidiary for the concurrent period. With regard to their manufacturing activities, partly conducted through owned and controlled subsidiary companies, the various works had been well employed during the year. The electrical accessories works at Birmingham had benefited by the addition of premises and plant, resulting in a satisfactory increase in output. The electric light fixtures works at Acocks Green, Birmingham, continued to be well employed and some important work had been designed and carried out there. They were also successful in securing a share of the business in floodlighting in connection with the Jubilee illuminations. The stove works and foundry at Rainhill had maintained their output, and the electric cable works at Wandsworth were making satisfactory progress, the increased output having fully justified the extensions made. The subsidiary company dealing with neon signs had carried out a number of distinctive installations, among them being a decorative scheme executed by Ionlite, Ltd., for the Brighton Electricity Department. Trading during the past few months of the current year showed an increase.

The Jerusalem Electric & Public Service Corporation, Ltd.—Presiding at the annual meeting on July 24th, Mr. W. Shearer (chairman) said that at the end of the year under review the number of consumers totalled 8,243, an increase of 2,000 over the previous year, and during the first months of the current financial year another 1,000 were connected. Ramallah, Bethlehem and Beit Jallah continue to grow as consuming centres, and apart from immigrants who were being connected, the population was becoming more electrically minded. Street lighting also showed a satisfactory increase during the year. During the five years that the company had been in operation eighty miles of cables and transmission lines had been laid and erected, and it had been necessary during the past year to increase the generating capacity of the power station, while further extensions to the station and to the transmission lines had been undertaken during the last two or three months and a further revision of tariffs had just been introduced, which would show its effects later in the current year. The growth of load for industrial purposes was being encouraged, and in the near future should reflect itself in further reductions of rates for domestic purposes. New suburbs were springing up and existing quarters extending, and given the introduction of suitable industries to absorb the increasing population, and stable political conditions, further improvement could be anticipated.

The Bagdad Light & Power Co., Ltd., held its annual meeting on July 24th, when Sir William G. Max Muller (chairman), who presided, said that 1934 was the first full year of operation of the new power station at Sarrafiah, and the normal result was to be seen in the lower cost of generation. During the year the consumers increased by 29.5 per cent., and the kWh generated and sold by 21.6 per cent. and 24.9 per cent. respectively. This was in spite of the fact that in the early months setbacks were experienced in consumption and receipts by the continuation of the boycott into April. Rapid development was taking place in Bagdad and its suburbs, and about 3,000 houses were either under construction or were planned, as well as new streets and places of entertainment. This meant that the prospects were encouraging, and if the progress shown by the receipts during the first five months of the current year was maintained they had every reason to expect that the higher figure given in the prospectus would soon be reached.

Christy Bros. & Co., Ltd., report a profit for the year ended March 31st last of £22,346, as compared with £23,007 for the preceding year, which with £20,029 brought in, interest and dividends on investments, &c., makes £54,257. From this is deducted income-tax, loan interest, &c., and £10,000 is placed to general reserve. The ordinary dividend for the year is maintained at 10 per cent., and £18,638 is carried forward. The report states that the accounts of Christy Bros. (Wireless Relays), Ltd., are now in course of preparation, but the trading results are excluded from the accounts of the parent company. In July last the North Somerset Electric Supply Co. issued 100,000 £1 ordinary shares. The quota due to Christy Bros. was accepted, the purchase price being financed by a temporary loan from the company's bankers.

The Lancashire Electric Light & Power Co. has decided to offer 396,000 ordinary shares of £1 each at 30s. per share to holders of existing ordinary shares and the 7 per cent. participating preference shares in the proportion of one new ordinary share for every seven shares held. These form part of the 400,000 new ordinary shares authorised on May 30th last. The balance of the authorised share capital, together with any shares not applied for by shareholders will be disposed of by the directors to the best advantage of the company. The new shares will rank for dividend as from January 1st next, but interest will be paid on December 31st next at the rate of 4 per cent. per annum, less tax, on the amount payable on application (including the premium of 10s. per share) as from the date of allotment, and on two subsequent instalments as from their respective due dates, to December 31st next.

The company is paying an interim dividend on the ordinary shares of 2½ per cent. (same), less tax.

The General Electric Co. (New York) reports a net profit for the first six months of the current year of $11,541,428, equivalent to 40 cents a share on 28,845,927 shares of common stock outstanding, as compared with $9,463,091, equivalent after dividends of $1,287,534 on the special stock to 28 cents per common share, in the corresponding period of last year. Orders received during the first half of 1935 totalled $104,542,946, as against $92,154,642 in the first six months of 1934, an increase of 13 per cent.

The London Associated Electricity Undertakings, Ltd., which was formed in February last to acquire by exchange the share capitals of six London electricity supply companies (the Charing Cross, Chelsea, Brompton and Kensington, Westminster, Kensington and Knightsbridge, and the St. James' and Pall Mall companies), announces that assent has been received from the holders of over 90 per cent. in value of fourteen classes of share capital within four months from the date of offer. Notices of compulsory acquisition have been sent to the remaining holders in those classes. In respect of the fifteenth (or the remaining) class of share 93 per cent. in value of the holders have accepted, but not within the statutory period of four months. The amount outstanding, therefore, represents one half of one per cent. of the total share capital proposed to be acquired. No transfer duties have been paid in respect of the shares acquired, and the total preliminary expenses of carrying out the scheme of merger amounted to £9,000, including the capital duty paid. The associated companies have declared an interim dividend of 3 per cent. on account of the standard dividend of 7 per cent., and this is being passed on to the ordinary stockholders of the new company, less tax. It is further announced that as from the Michaelmas reading there will be available to consumers for all of the Associated Company's area a two-part tariff. For domestic premises this will consist of a primary charge on the basis of floor space, plus a running charge, not exceeding ¾d. per kWh, according to the circumstances of each area. For commercial premises there will be a primary charge calculated on the kW of connected load on the premises to be assessed, and a running charge not exceeding 1d. per kWh. The board is also preparing a scheme for assisted wiring and the hire of apparatus.

The La Plata Electric Tramways Co. reports that owing mainly to increased competition from omnibuses, the gross receipts in 1934, at par of exchange, declined by £9,804 to £113,017, and the net receipts were £14,285, against £23,815 for 1933. After deducting exchange losses, debenture interest, &c., there is a balance of £3,515. This is added to a balance brought in, and the amount carried forward is £24,109. Arrears of preference dividend amounted at December 31st last to £205,000.

J. & F. Stone Lighting & Radio, Ltd., propose to take over a business of similar size and character at a purchase price of £133,000. It is also proposed to increase the capital from £155,000 to £300,000 by the creation of 85,000 £1 6 per cent. cumulative redeemable preference shares and 240,000 5s. shares. To finance the acquisition the preference shares will be issued. An extraordinary meeting to consider the proposals will be held on August 16th.

The Bedfordshire, Cambridgeshire, & Huntingdonshire Electricity Co.—The control of this company has been transferred from the North Metropolitan Electric Power Supply Co., to Edmundson's Electricity Corporation, Ltd.

The Bristol Tramways & Carriage Co., Ltd., has declared an interim dividend of 3 per cent. (less tax) on the ordinary shares.

The City of London Electric Lighting Co., Ltd., has announced an interim ordinary dividend of 3½ per cent. (same).

Stocks and Shares

TUESDAY EVENING.

THE weight of accumulated capital continues to make its influence felt upon the gilt-edged markets of the Stock Exchange. It may be that investment feels a twinge of uncertainty in regard to the possible outcome of the next General Election; or may be that industrial shares have now reached prices which give pause to prospective purchasers. Whatever the cause, the effect is seen in a steady stream of buying in the Safety First sections. Any stock that offers 3 per cent. and redemption at fixed date, or dates, is assured of welcome. It is said that a string of borrowers awaits the signal of permission to issue the new stocks for which there seems, judged by recent experience, to be ready-made public demand.

Central Electricity and Other Boards

The Government are being asked by five Members of Parliament to publish fuller information in regard to the Central Electricity Board than is at present given in the Board's annual report. These M.P.s want to know the actuarial basis underlying the financial provisions which are being made to meet net revenue, interest, redemption and obsolescence. The question was raised about a fortnight ago, when the Parliamentary Secretary to the Minister of Transport repeated the obligations which are laid upon the Central Electricity Board by Parliament. This inquiry will not be dismissed, it is to be hoped, as inquisitive or inquisitorial, for, if it is frankly met, the resultant information might lead to the Central Electricity Board securities being made eligible for inclusion among Trustee investments.

Parliament is rightly very jealous about the area over which trustees may spread money; but, in view of the present-day scarcity of trustee stocks, the admission of the Central Board's issues into the charmed circle would give the trustee a wider scope of selection. It will be necessary, of course, to take every care to see that the security is sound enough to warrant the stocks being added to the Trustee List.

Cables Investment

Cables Investment Trust stocks are hardening up, now that the stags have practically finished their profit-taking. The

£10 preference shares, issued at 10¼, have gained 1s. 3d. at 2s. 3d. premium, and the 3½ per cent. debenture stock, from being ¼ discount, has improved to 3s. 8d. premium. It seems likely that these prices will show further advances in the near future, for both securities are of the class which appeals to the present-day investor. Cable & Wireless (Holdings) stocks rallied after being distinctly dull. The 5½ per cent. preference is 10s. up at 10s. 1½d. The "A" ordinary receded to 25½, the "B" to 7½. The former recovered to 26½, but the "B" remained heavy. Globe ordinary at 14 and the preference at 14½ are down by 10s. and 5s. respectively.

Electricity Supply Shares

Active business in the newly offered ordinary shares of the Lancashire Electric Light & Power Company resulted in a decline from 8s. premium to about a shilling less. This indicates that some of the allottees were cashing their rights, accepting them as an extra dividend not subject to income-tax. The old shares are ex rights, at 38s. Yorkshire Electrics at 44s. 6d. show a gain of the pence. Llanellys at 25s. 6d. are a shade lower. The ordinary shares in the London group are virtually unchanged: if anything, the tone is a trifle easier. That is to say, a buyer can get shares a little more cheaply than he could have done a week ago. Some of the foreign issues have strengthened. Palestine "A" ordinary are up to 45s. on talk of an increase in the dividend. Whitehall 7½ per cent. preference at 25s. are 6d. higher.

Manufacturing and Equipment

Confident recommendation of Associated Electrical Industries shares by brokers to their clients brought in a number of buyers and, on this, the price rose 2s. to 36s. 6d. With these, Associated Equipment were also bought, though to a lesser extent. The price is 43s. 9d. Enfield Cables ordinary are ½ up at 5½: Enfield Rolling Mills, which had a sharp spurt to 29s. 3d., soon came back to 28s. 3d. British Insulated and Henleys improved their previous prices. Crompton Parkinsons are a good market at 70s. Vague and unconfirmed rumour says that Cromptons have agreed to work in harmony with other companies engaged in similar operations. A rise of 3s. 6d. took Electric Constructions to 26s. Telegraph Constructions are 1/8 lower at the same price. International Automatics fell back to 41s. 6d., the "B" to 40s. 6d.

The Rising Tide of Prices

British Aluminium shares are the focus of a lively circle of interest. The price has put on 3s., at 44s.; there is some talk of agreement between this company and one or two others. The activity in aeroplane manufacture has stimulated buying of British Aluminiums. Johnson & Phillips rose 1/8, to 40s. 9d., on anticipations of an advance in the dividend from the last-paid 7½ per cent. Brush ordinary stock has dropped 4½ points, to 40, but the movement is exceptional to the strength exhibited by industrial shares in most departments of the House, the electrical manufacturing and equipment prices coming in for their full share of the cheerful bullishness that prevails. It is unusual to find, on the eve of August bank holiday, such animation as that now ruling in commercial and industrial shares.

This Week's Railway Conference

London and Home Counties 4½ per cent. stock of 1955-75 has come into notice, and the price is 1½ higher at 113½. Central Board issues maintain their previous prices. The lately offered London Electric Transport 2½ per cent. guaranteed debenture stock which was over-subscribed at 97, is quoted at 7s. 6d. premium. On Friday in this week, the Glasgow Corporation will meet representatives of the London Midland and Scottish and the London and North-Eastern Railways for what promises to be a very interesting discussion. Glasgow wants to talk over suggestions for electrification of the railways in the West of Scotland. The Corporation has one eye upon the balance of eight million pounds voted by the Government for electrifying London lines, and the other eye upon the unemployment problem that presses upon Glasgow and adjacent areas.

American Bullishness

An advance of 5 dollars in the price of American Telephone and Telegraph shares is an apt illustration of the brighter outlook that American stocks and shares are now deemed to be facing. New York has thrown off some of her prolonged depression. Industrial and railroad stocks are moving upwards. The daily turnover in Wall Street gives indication of progressive increase. The new-found confidence may prove to be no more than a transient sentiment, but, for the moment, it is putting up prices and energising the financial arteries of New York.

Miscellaneous Matters

The County of London Electric Supply Company has announced a new reduction in its unit rate for the supply of water-heating, this change being a continuation of the County Company's programme of reduction and standardisation of rates.

Iron and steel shares are in cheery mood. Business is, perhaps, not quite so active as it was a few weeks ago; but, for all that, the market attracts considerable public attention. The rubber market, on the other hand, softly slumbers.

Share List of Electrical Companies

Home Electricity Companies.

	Nom.	Dividend 1933.	Dividend 1934.	Price July 30.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	1	15	15	78/9	—	3 16 5
Brompton Ordinary	1	7	7	34/–	—	4 2 4
Charing Cross Ordinary	1	7	7	34/6	—	4 1 2
Chelsea	1	7	7	34/6	—	4 1 2
City of London	1	7½	7½	36/–	—	4 3 4
Clyde Valley	1	7	8	44/–	—	3 12 9
County of London	1	10½	10½	58/–	—	3 12 5
Edmundson's 7% Pref.	1	7	7	36/–	—	3 16 9
Elec. Dis. Yorkshire	1	9	9	49/–	—	3 13 6
Elec. Supply Corporation	1	11	11	3½	—	3 10 5
Kensington Ordinary	1	7	7	34/6	—	4 1 2
Lancs Light and Power	1	7½	7½	38/–xr	—	3 19 0
London Electric	1	7	8	38/–	—	4 4 3
Metropolitan	1	10	10	53/6	—	3 14 9
Midland Counties	1	7	7	39/6	—	3 10 10
Mid. Elec. Power	1	8	8	42/–	—	3 16 9
North Eastern Electric Ordinary	1	6	6	34/6	—	3 9 8
Do. 7% Pref.	1	7	7	36/–	—	3 17 9
Northampton	1	10	10	53/9	—	3 14 1
Notting Hill 6% Pref.	10	6	6	14½	—	4 1 4
North Met. Elec. Ordinary	1	10	10	58/3	—	3 9 0
Do. do. 6% Pref.	1	6	6	32/–	—	3 15 0
St. James and Pall Mall	1	7	8½	34/–	—	4 17 1
Scottish Power	1	8	8	42/6	—	3 15 4
South London	1	7	7	35/–	—	4 0 0
Westminster Ordinary	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	25/–	+6d.	6 0 0
Yorkshire Elec.	1	8	8	44/6	+6d.	3 12 0

Public Boards.

Central Electricity, 1950–70	Stock	5	5	117	—	4 5 6
Do. 1955–75	,,	5	5	119	—	4 4 0
Do. 1951–73	,,	4½	4½	110	—	4 1 10
Do. 1963–93	,,	—	3½	104	—	3 7 0
London & Home Counties, 1955–75	,,	4½	4½	113½	+1½	3 19 4
London Passenger Transport, A	,,	—	4½	124½	—	3 12 3
Do. do. B	,,	—	5	127½	—	3 18 9
Do. do. C	,,	3	—	98	—	3 1 3
West Midlands Joint Elec. 1948–68	,,	—	5	115	—	4 7 0

Telegraph and Telephone.

American Tel. & Tel.	$100	9	9	133½	+5	6 14 10
Anglo-Am. Tel. Pref.	Stock	6	6	116½	+1	5 3 0
Do. Def.	,,	1½	1½	27½	—	5 9 1
Cable & Wireless 5½% Pref.	,,	2½	4½	101½	+½	4 1 8
* Do. A. 7½% Ord.	,,	Nil	Nil	26½	—	—
Do. B. Ord.	,,	Nil	Nil	7½	–½	—
Globe Tel. & Tel. Ord.	10	2½	3½	14	–½	2 10 0
Do. do. Pref.	10	6	6	14½	–½	4 4 3
Great Northern Tel.	10	20	20	39	—	5 5 3
Marconi-Marine	1	10	7½	32/6	—	4 12 4
Oriental Telephone Ord.	1	12	12	3½	—	*3 13 10

Home and Foreign Trams, etc.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	2/–	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	,,	5	5	1100	—	—
Do. do. Pref. Ord.	,,	8	8	176½	—	4 10 8
Brazil Traction	100	—	—	8½	–½	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	98½	—	5 1 6
Mexican Light Common	100	Nil	Nil	3	—	—
Do. 7% Pref.	100	7	7	4½	—	—
Do. 1st Bonds	$500	5	5	44½	—	—
Victoria Falls Ord.	1	20	20	8½	–½	2 7 0
Yorkshire (West Riding)	1	5	6½	33/9	—	3 17 0

Manufacturing Companies.

Aron Electricity Ord.	1	10	15	3	—	5 0 0
Assoc. Elec. Ord.	1	4	6	36/6	+2/–	3 5 9
Do. Prf.	1	8	8	37/6	—	4 5 4
Babcock & Wilcox	1	6	8	50/–	—	3 4 0
British Aluminium Ord.	1	5	7½	44/–	+3/–	3 7 6
British Insulated Ord.	1	5	15	4½	+½	3 6 8
Brush Ord.	Stock	Nil	Nil	40	–4½	—
Callender's	1	15	15	3½	—	4 0 0
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord.	5/–	—	12½	3½	+½	0 18 6
Do. 8% Pref.	1	8	8	36/3	—	4 8 5
Edison Swan 1st Pref.	1	7½	7½	27/6	—	5 9 0
Electric Construction	1	Nil	3½	26/–	+3/6	2 13 9
Enfield Cable Ord.	1	25	25	5½	+½	4 15 3
English Electric	1	Nil	Nil	16/3	—	—
Do. do. Pref.	1	Nil	Nil	21/3	—	—
Ever Ready	5/–	35	35	21/–	—	8 6 8
Ferranti Pref.	1	7	7	28/3	—	4 19 0
G.E.C. Pref.	1	6½	6½	33/9	–1/8	3 17 4
Do. Ord.	1	8	10	57/6	+6d.	3 9 6
Henley's	1	30	30	6¾	+1/8	4 9 0
Do. 4½% Pref.	5	4½	4½	5½	—	3 16 8
India-Rubber Preferred	1	—	5½	1½	—	4 17 9
Johnson & Phillips	1	5	7½	40/9	+1/3	3 13 6
Siemens Ord.	1	6½	4	1½	—	3 7 5
Telegraph Construction	£1	Nil	Nil	26/3	–1/8	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1933

26465. "Electro-magnetic interrupters." P. R. Mallory & Co., Inc. September 27th, 1932. (431137.)

27199. "Cathode-ray tubes." Electric & Musical Industries, Ltd., G. E. Condliffe, I. Shoenberg and W. F. Tedham. October 3rd, 1933. (Cognate application, 20960/34). (431327.)

34333. "Electric-discharge lamps." Siemens Electric Lamps & Supplies, Ltd., and J. N. Aldington. December 6th, 1933. (431382.)

35612. "Filaments for electric lamps and the like." British Thomson-Houston Co., Ltd. December 31st, 1932. (431333.)

1934

258. "Television transmitters." Marconi's Wireless Telegraph Co., Ltd. January 3rd, 1933. (431207.)

267. "Television or like systems." J. L. Baird and Baird Television, Ltd. January 3rd, 1934. (431339.)

268. "Television and like systems." J. C. Wilson, and Baird Television, Ltd. January 3rd, 1934. (431340.)

279. "Electric fire-alarm systems." W. S. Steljes. January 4th, 1934 (Cognate application, 14819/34). (431343.)

432. "Electric signalling systems." A. P. Hill, and the Exchange Telegraph Co., Ltd. January 5th, 1934. (431395.)

451. "Mounting arrangements for electrical apparatus." Automatic Electric Co., Ltd., and R. N. Saxby. January 5th, 1934. (431348.)

452. "Electro-magnetic switching devices." Automatic Electric Co., Ltd., and C. R. Woodland. January 5th, 1934. (431349.)

579. "Automatic regulating systems for the supply from a rotary transformer fed from a variable direct-current source." British Thomson-Houston Co., Ltd., C. G. Mayo, and J. Moir. January 6th, 1934. (431401.)

617. "Method of producing fluorescent screens, more particularly for Braun tubes." Radioakt.-Ges. D. S. Loewe and K. Schlesinger. January 10th, 1933. (431404.)

670. "Luminous electric-discharge tubes." General Electric Co., Ltd., and J. W. Ryde. January 8th, 1934. (431408.)

673. "Luminous electric-discharge tubes." General Electric Co., Ltd., and J. W. Ryde. January 8th, 1934. (431409.)

858. "Ignition systems of internal-combustion engines." W. O. Kennington, and Delco Remy & Hyatt, Ltd. January 9th, 1934. (431411.)

1065. "Controller arrangement for electrically-driven road vehicles." H. G. A. R. Wilson. January 11th, 1934. (431149.)

1066. "Electric motor controlling and like switching arrangements." A. E. Morrison & Son, Ltd., A. E. Morrison and A. C. Morrison. January 11th, 1934. (431412.)

1388. "Tuning-scales for radio receiving sets." E. K. Cole, Ltd., E. J. Burtenshaw and R. K. Spencer. January 15th, 1934. (431151.)

2716. "Operating mechanisms for electric circuit-breakers." G. Ellison, Ltd., and J. Anderson. January 26th, 1934. (431156.)

3197. "Electrical means for heating hot-water radiators or pipe systems or the like service." H. Harvey, jun. January 31st, 1934. (431157.)

3463. "Automatically operated snap-action electric switches." J. Cecil. February 2nd, 1934. (431159.)

3843. "Electric cooking or heating apparatus." Simplex Electric Co., Ltd., and P. W. Davis. February 6th, 1934. (431161.)

4961. "Train-end magnet." Siemens & Halske Akt.-Ges. February 24th, 1933. (431210.)

5574. "Circuits for use in connection with magnetostrictive oscillators." F. D. Smith, A. B. Wood, J. A. McGeachy and C. V. Drysdale. February 20th, 1934. (431276.)

5998. "Electric-discharge lamps." General Electric Co., Ltd., and J. W. Ryde. February 23rd, 1934 (Addition to 401846). (431417.)

6730. "Electric incandescent lamps." General Electric Co., Ltd., and B. P. Dudding. March 2nd, 1934. (431212.)

7215. "Magnetic appliances for use in medical treatment." J. F. Blacksell. March 7th, 1934. (431363.)

7664. "Rotary electric switches." A. Davy and Weston Electrical Instrument Co., Ltd. March 10th, 1934. (431280.)

7692. "Dynamo-electric machines." R. B. Pullin & Co., Ltd., and C. G. Pengelly. March 10th, 1934. (431419.)

8862. "Electric transformers." Foster Engineering Co., Ltd., and R. I. Bagnall. March 21st, 1934. (431167.)

9436. "Control of vapour-arc rectifiers." English Electric Co., Ltd., J. E. Calverley and S. E. Newman. March 26th, 1934. (431281.)

9667. "Electric switch-plugs." H. N. Baker, and C. W. Parsons. March 28th, 1934. (431421.)

10364. "Means electrically responsive to the establishment of a contact of short duration." British Thomson-Houston Co., Ltd. April 5th, 1933. (431422.)

10430. "Electric lamp standards." A. H. Curtis. April 6th, 1934. (431423.)

11234. "Protective devices for use with electrically-operated burglar-alarm apparatus." H. E. Bayliss and J. A. Bower. April 13th, 1934. (431424.)

11417. "Electrical vibro-massage apparatus." General Electric Co., Ltd., and D. A. Jennings. April 16th, 1934. (431366.)

11950. "Electric motor control apparatus." Westinghouse Electric & Manufacturing Co. April 22nd, 1933. (431224.)

12760. "Electric control and indication of point-operating mechanisms for railways and the like." R. M. Macgregor, D. G. Shipp, and the Westinghouse Brake and Signal Co., Ltd. April 27th, 1934. (431289.)

14273. "Connecting devices for use with insulated flexible electric conductors." Sir E. M. Hughman. May 11th, 1934. (431428.)

14524. "Electric invertors." General Electric Co., Ltd., and C. R. Dunham. May 14th, 1934. (431230.)

15532. "Supporting means for electric-discharge rectifier vessels." British Thomson-Houston Co., Ltd. May 24th, 1933. (431430.)

16622. "Electric control systems." A. S. Fitzgerald. January 2nd, 1934. (Divided out of 34209/32.) (431171.)

16934. "High-frequency coupling elements consisting of at least two coils inductively coupled to each other." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 27th, 1933. (431292.)

18024. "Electric heating elements for boiling or hot-plates of electric cooking stoves and the like." Moffats, Ltd., and E. S. Smith. June 18th, 1934. (431232.)

18483. "Twin-magneto construction for internal-combustion engines." G. & J. Weir, Ltd., and C. G. Pullin. June 22nd, 1934. (431431.)

18981. "Electro-magnetically operated mercury switch relays." W. W. Triggs (Adlake Co.). June 27th, 1934. (431233.)

21335. "Luminous electric-discharge tubes." H. J. C. Forrester (Luminous Tube Lighting Corporation). July 20th, 1934. (431298.)

23966. "Apparatus for the registration of signals in telephone installations." E. Zoller. August 21st, 1933. (431239.)

29074. "Electric cord take-up devices." J. Namet, A. B. Gardella, and G. C. Guckes. October 10th, 1934. (431244.)

29938. "Braun tubes." M. Von Ardenne. November 30th, 1933. (431246.)

30255. "Detent devices for retaining pointers, controllers, and other adjustably movable elements in adjusted position." Hall Telephone Accessories (1923), Ltd., and F. W. Hall. October 22nd, 1934. (431439.)

31614. "Terminals for batteries." J. G. Bouracier and H. O. Taylor. November 3rd, 1934. (431441.)

32904. "Supports for electrical apparatus." Siemens-Schuckertwerke Akt.-Ges. November 15th, 1933. (431310.)

33069. "Carbon arc lamps." Zeiss Ikon Akt.-Ges. November 16th, 1933. (431312.)

35946. "Thermionic amplifiers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 7th, 1933. (Divided out of 9023/34.) (431180.)

37095. "Electric lamp caps." E. R. Grote. December 1st, 1933. (Divided out of 431,332.) (431376.)

1935

2757. "Lighting or like devices comprising at least two gas-filled electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 8th, 1934. (431321.)

4111. "Lighting installations." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 19th, 1934. (431252.)

5451. "Method of and apparatus for producing short electromagnetic waves." Dr. O. Heil. February 23rd, 1934. (Cognate application 5452-35.) (431447.)

6180. "Method of and apparatus for melting glass electrically." Patent-Treuhand Ges. für Elektrische Gluhlampen. March 2nd, 1934. (Cognate application 6181/35.) (431449.)

6192. "Artificially cooled mercury-vapour discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. November 6th, 1934. (431450.)

6232. "Electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 16th, 1935. (431451.)

6291. "Electric welding fluxes." British Thomson-Houston Co., Ltd. February 27th, 1934. (431324.)

6912. "Electric resistance heating units." British Thomson-Houston Co., Ltd. March 6th, 1934. (431453.)

7723. "Thermionic oscillation generators." Compagnie Générale de Télégraphie sans Fil. March 22nd, 1934. (431455.)

9878. "Electric heating elements." H. H. Berry. March 29th, 1935. (Addition to 303597.) (431185.)

13859. "Television or like systems." J. L. Baird and Baird Television, Ltd. January 3rd, 1934. (Divided out of 431339.) (431458.)

14056. "Television transmitters." Marconi's Wireless Telegraph Co., Ltd. January 3rd, 1933. (Divided out of 431207.) (431258.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from July 24th:—

Franco. No. 551553 and Franco Signs. No. 551554. Class 8. Electrically illuminated advertising and the like signs.—Franco-British Electrical Co., Ltd., 25, Oxford Street, W.1.

Mem. No. 559579. Class 8. Electric circuit controlling apparatus.—Midland Electric Manufacturing Co., Ltd., M.E.M. Works, Barford Street, Birmingham.

Sur Vita. No. 560575. Class 13. Electric lamps (ordinary).—Wartburg Lamps, Ltd., Imperial Works, Perren Street, Ryland Road, N.W.5.

Inelle. No. 560943. Class 13. Electric lamps (ordinary).—International Electrical Supplies Co., Ltd., 464, Kingsland Road, Dalston, E.8.

Aladdin. No. 548231. Class 14. Lamp shades, lamp-shade supports, and electric light standards, brackets and sockets, all being goods made of aluminium.—Aladdin Industries, Ltd., Aladdin Building, Greenford, Middlesex.

Encouraging Accumulator Development

The Société Française des Electriciens has recently decided to institute a Gaston Planté bronze medal which, together with a money prize of 4,000 fr., is to be awarded every three years to the Frenchman or foreigner who, in the opinion of a jury, by his scientific or technical work makes the best contribution to the accumulator or dry battery manufacturing industry or to electrochemistry in general. The first award of the medal and prize is to be made in 1937, and competitors will be required to submit their papers with, if possible, a translation in French, six months before the appointed time. Full particulars can be obtained from the Société at 14, Avenue Pierre-Larousse, Malakoff (Seine), France.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Abbots Langley.—R.C. church, Breakspear College; Rev. Father Charles.

Aldenham.—Chapel, assembly hall, and other alterations, Aldenham School; governors.

Ashford (KENT).—Cinema, High Street (£40,000); proprietors, Regal Cinema, Marble Arch, London, W.1.

Ashton-under-Lyne.—Employment exchange, for H.M. Office of Works, King Charles Street, London, S.W.1.

Audenshaw.—Houses (200); Alan Deane, builder, Roker Park Estate.

Aylesham.—Cinema; Francis Hole.

Birkenhead.—Technical college, Borough Road; Education Committee.

Birmingham.—Houses (250) and shops, Mill Pool Hill Estate; Lanchester Housing Trust, Ltd. Factory, Icknield Port Road; B. Whitehouse & Sons, builders, Monument Road, Edgbaston. Flats, Coventry Road (£43,000); city engineer. Extensions to Victoria Law Courts (£136,000); General Purposes Committee.

Blackpool.—Garage under the promenade (£120,000) and covering of Talbot Bus Station (£150,000); Transport Committee.

Bradford.—Houses (318), Brompton Road; F. Holmes, St. Annes-on-Sea and Skipton Building Society. Houses (150) and tenements, Canterbury Estate (£212,200); city architect.

Brentford.—Two blocks of flats, Holly Lodge site; borough engineer.

Brierley Hill.—Houses (442); George Smith (Birmingham), Ltd., builders.

Brighton.—Block of offices, shops and flats, Gloucester Place and Marlborough Place, for the Constitutional Property Investment Trust, Ltd., 51-55, Strand, London, W.C.2. Premises for Timothy Whites & Taylors, Ltd., Western Road; Brighton Corporation. Central transport depôt (£20,000) and sun bathing station and solarium, Black Rock (£40,000); borough engineer. Alterations to 27-8, Western Road; Liptons, Ltd. Reconstruction of School of Art, for E.C.

Bromley (KENT).—Church, Pickhurst Lane and Manor Road; Congregational Authorities.

Buckinghamshire.—Schools, Cippenham and Langley; county architect, Aylesbury.

Burnham-on-Sea.—Cinema, for W. Trueman Dicken, proprietor of the Trueman Dicken Circuit of Cinemas.

Burscough.—Factory (£50,000); T. Riding & Son, builders, Ormskirk.

Burton-on-Trent.—Business stores, High Street (£20,000), for the Co-operative Society; A. H. Turner, secretary.

Bury St. Edmund's.—Factory, Fornham Road, for Bury St. Edmund's Pure Ice Co., Ltd.; R. A. C. Olle. Town hall and offices, Angel Hill; borough surveyor.

Caernarvonshire.—Girls' County School, Bangor; W. Lloyd Jones, county architect, Caernarvon.

Canterbury.—Rebuilding business stores, 5 and 6, The Parade, for Timothy White & Taylors, Ltd., Chandos Street, Portsmouth.

Chatham.—Houses (80) and bungalows; W. T. Davis & Sons, Ltd., builders.

Cheltenham.—Extensions to hospital (£29,881); Spackman & Sons, builders, Hunt Street, Swindon.

Chesterfield.—Central stores, with hall, board room and offices, Elder Way, for the Co-operative Society; C.W.S. architect, Balloon Street, Manchester.

Clydach (NEAR SWANSEA).—Extensions to works (£150,000); Mond Nickel Co.

Cockfosters (MIDDLESEX).—Houses (600), Trent Park Estate; Ernest Owers, Ltd.

Croydon.—Offices, George Street and Wellesley Road; Woolwich Equitable Building Society.

Doncaster.—Houses (46); R.D.C. surveyor.

Durham.—Houses (106); housing architect, Byland Lodge, Hawthorn Terrace.

Ebbw Vale.—Houses (72); Health and Housing Committee.

Edinburgh.—Barracks and Military Hospital, Redford (£250,000); War Office.

Exeter.—Lay-out for aerodrome, Honiton Clyst; city engineer.

Featherstone (YORKSHIRE).—Houses (26), Little Lane; U.D.C. surveyor.

Fleetwood.—Houses (212), for J. Cryer & Sons, builders.

Gillingham (KENT).—Cinema, King's Hall site (£25,000); W. Garrett, proprietor, King's Hall.

Gloucestershire.—School, Hanham Abbott, near Bristol, for C.C.; Spackman & Sons, builders, Hunt Street, Swindon.

Great Yarmouth.—Head Post Office, Hall Quay, for H.M. Office of Works, King Charles Street, London, S.W.1.

Guisborough (YORKSHIRE).—Houses (30); W. Thompson, builder, Northallerton.

Harlington.—Estate development; Greville Collins & Co.

Harrow.—Development of Nower Hill Estate; H. W. Davies & Harwood Nash & Co.

High Wycombe.—Senior schools (960 places), for Borough E.C.; Thurlow & Lucas, architects, 25, High Street.

Hinckley.—Cinema (2,000 seats), Palladium site, for Odeon Theatres, Ltd.; H. W. Weedon, architect, Birmingham.

Hindley (LANCASHIRE).—Houses (90), Hindley Green; O. P. Abbott, U.D.C. surveyor.

Huddersfield.—Cinema, shops, showrooms and restaurant for Union Cinemas, Ltd.; J. Wimpenny & Co., builders, Spurn Point, Linthwaite.

Ince (LANCASHIRE).—Houses (34); A. Wigan & Son, builders, Wigan.

Ipswich.—Cinema (2,500 seats); G. H. Farrer.

Irthlingborough.—Houses (50), Jubilee Estate; W. Thompson.

Irvine.—Houses (100); burgh surveyor.

Isleworth.—Houses, Bridge Road; Clayton Farm Estates, Ltd.

Jarrow-on-Tyne.—Houses (150); borough engineer.

Keighley.—Houses (69), Harden Road; Mrs. A. L. Saxton. Houses (52), Woodhouse Estate; Ernest Turner, Ltd.

Kent.—School, Petham; E. Salter Davies, director of education, Maidstone.—Extensions to nurses' home, &c., Farnborough; county architect.

Kettering.—Houses (85), near Piper's Hill Lane; Drury & Co., Ltd.

Kilmarnock.—Houses (236); Wm. Dunker, burgh surveyor, Market Bridge.

Kilsyth.—Houses (250); J. I. Little, burgh surveyor, Innsbridge, Kilsyth.

Kirkburton (WEST RIDING).—Extensions to nurses' home, Storthes Hall Mental Hospital; W. E. H. Burton, architect, Mental Hospital, Wakefield.

Largs.—Cinema, ballroom and café at pierhead; Harry Kemp.

Leatherhead.—Houses (174), Common Field Estate, Forty Foot Road; C. H. Runnalls & Sons, Ltd.

London.—(BALHAM).—Rebuilding, Oldridge Road School; L.C.C. architect. (BERMONDSEY).—Flats (60), Upper Grange Road (£33,000); works manager. Tenements, Minto Street (£164,000), and central schools, Rolls Road and Monnow Road; L.C.C. architect. (E.C.3).—Rebuilding, 37, Houndsditch and 18, Bevis Marks; John Farrer & Sons, architects, 7, Norfolk Street, W.C.2. (E.C.2).—Reconstruction of 93, Cheapside and 39-40, King Street; National Mutual Life Assurance Society. (GREENWICH).—Six blocks of dwellings, Victoria Road, Charlton (£21,420); borough surveyor. (ISLINGTON).—Enlargement of Holloway School; L.C.C. architect. (LAMBETH).—Tenements (284), Tyers Street (£124,000); L.C.C. architect. (POPLAR).—Flats (50), Harrow Lane (£35,577); borough engineer. Extensions to St. Andrew's Hospital, Devons Road; R. J. Truscott, Ltd. (S.E.1).—Extension of County Hall, Belvedere Road (£1,097,500), for L.C.C. (ST. PANCRAS).—Tenements, Ferdinand Place and Highgate Road (£56,000); Tarran Industries, Ltd., and A. J. Thomas, architect. (STOKE NEWINGTON).—Dwellings, Church Street (£33,350); L.C.C. architect. (WESTMINSTER).—Houses, 4-8, Rutland Gate; Burnet, Tait and Lorne, 1, Montague Place, W.C.1. Block of flats, Down Street and Piccadilly; Trussed Concrete Steel Co., Ltd. News theatre, 138, Park Lane; Stanley Hicks & Son. Nurses' home and medical school for Westminster Hospital, St. John's Gardens; Adams, Holden & Pearson, architects. Shops and flats, 32-41, Half Moon Street; Elcock & Sutcliffe, 60, Strand, W.C.2. Tenements, Ebury Bridge (£20,000); Humphreys, Ltd., Knightsbridge, S.W.7. (WOOLWICH).—Dwellings (182), Middle Park Estate, Eltham (£74,000); Housing Committee.

Middlesbrough.—Houses, Benton Avenue and Briardene Avenue; N. Thompson, Ltd., builders, Stonehouse Street, Linthorpe.

Newcastle-on-Tyne.—Senior elementary school (480 places), Northumberland Road; director of education. Extensions to premises, Welbeck Road, for the Co-operative Society; C.W.S. Architects' department, 90, Westmorland Road.

Newmarket (SUFFOLK).—Cinema, near High Street, for Kingsway (Newmarket), Ltd.

Nottingham.—Covered market, Sneinton (£70,000), with electrical work; city engineer.

Shipley.—Houses (112), Victoria Park Estate; H. Chippindale.

Sittingbourne.—Houses (23), Winter Avenue, for A. Porter.

Slough.—Factory, Oxford Avenue; Slough Estates, Ltd. Public offices; C. H. James, architect, Gower Street, London, W.C.1.

Southgate.—Houses (32), Prince George Avenue; F. F. Tomlin, 195, High Road, N.22. Houses (21), South Lodge Drive; G. W. Wheel, Pond House, Church Road, Buckhurst Hill.

South Hornchurch (ESSEX).—Houses (1,200), Great Mardyke Street; Artisans' Housing Development Trust, Ltd.

Southport.—Schools (720 places), Meols Cop, for Borough E.C.; L. Barnish, architect, Birkenhead.

Sunbury.—Houses, Beauclerc School Grounds; Miss A. M. Walter.

Sunderland.—Houses for aged persons, Hylton and Ryhope; J. Prentice, builders. Alterations to premises, Blandford Street for the Knightall Furnishing Co., Ltd.; G. E. Matkin, architect, Fawcett Street.

Surrey.—Central schools, Ewell and Stoneleigh; education secretary, Kingston-on-Thames.

Twickenham.—Houses (40), Wills Crescent; W. Taylor & Sons. Houses (20) and bungalows, Milner Drive and The Ridge; H. M. Grellier & Sons, architects.

Walsall.—Houses (104), Harden Estate (£27,513); Henry Lloyd.

Warrington.—Houses (136), Alder Lane, and sewage pumping station, with electrical equipment; borough surveyor. Cinema, Barbauld Street (£60,000); Lou Morris.

Warwickshire.—Infants' school, Atherstone, for County E.C.

West Riding.—Senior schools; education architect, Wakefield.

West Sussex.—Schools, Bognor Regis (£64,350), county architect, Chichester.

Whitley Bay.—Shops and houses, Front Street, for J. Nicholson; T. K. White, architect, 33, Great Market, Newcastle-on-Tyne.

Worthing.—Houses (152), King Edward Avenue, &c.; S. W. Phillips & Co. Houses (90), Ringmer Road; Jeffrey Houses, Ltd. Estate development, Ham Road, for H. B. Piper; H. M. Potter, architect. Hotel, West Parade and Grand Avenue; H. Osborne, architect.

York.—Houses (200) and flats; Tarran Industries, Ltd., builders, Hull.